AVIATION
FOR DECEMBER, 1933

The rapidly rising poundage of air express has been due in a large part to co-operation among the airlines in such matters as tariffs, transfers of shipments, and routing. The article herewith presented, while based on the past year's record of one of the interline systems, furnishes a representative picture of the progress during the year and of the important trends in traffic and in the application of air express to the solutions of the problems of many businesses.

Air Express Experiences

By T. Park Hay

First Chairman, General Air Express
Public Relations Director, Transcontinental & Western Air, Inc.

PROGRESS toward the solution of the problems of air express has been accelerated through co-operation among the transport lines, and interchange of shipments among member lines within the groups operating in the field has gone far to provide national distribution for merchandise moving by air. By giving first consideration to the interests of the shipper and to the conditions that justify the use of air transport in the moving of merchandise, it has been possible for air line groups to co-ordinate their services and the result has been a year of unprecedented growth for the express business.

Three steps are necessary in the formation of an interline system such as General Air Express, which came into being Aug. 3, 1932, as an informal unincorporated association of seven air lines.

1. Publication of a joint air express tariff to include through rates between all points served by member lines.

2. Perfection of a shipping document or a waybill to permit the free flow of traffic over the entire group.

3. To convince an insurance underwriter that the combined services of the airlines may be regarded as one operation as far as express is concerned, and obtain insurance covering the liability of the companies at a standard rate with the same simplicity as though a contract had been made with an individual line.

Consider the shipper

The greatest difficulty in a co-operative scheme of this character is the determination of a policy to control equitably the routing of traffic, since the natural desire of each member line is for long-haul movement. This problem has been kept under control from the beginning through the adoption of a routing policy made in the interests of the shipping public, viz.: that the routing be done in the manner which provided the earliest delivery to destination with the minimum number of transfers.

General Air Express is not in any way a pool arrangement. Each individual member line collects from each haul a rate which approximates 4 cents per mile per 100 lb., (80 cents per ton-mile). There have been, up to the present time, no rate agreements made among any of the lines in the group and the through rate structure contained in the Interline Tariff is made up by combining the rates in force on each one of the individual airlines. In the case of interline shipments moving over several different routes to a competitive point, revenues are divided among the lines on the basis of percentage of the total mileage flown by each of the companies involved.

Supervision is maintained by the Interline Express Committee, composed of a representative of each member line, and rotating the office of chairman once a year, with the assistance of S. F. Christy, general secretary. So far, there has not arisen within the group any serious problem which has in any way approached a breach.

Air Express is considered to be in the very earliest stages of infancy and poundage and number of shipments handled are not particularly impressive when we think of them in terms of a national transport system. We must bear in mind, however, that this business has been developed against the handicap of rates which range from five to six times greater than those for rail express and that the carrying capacity of the planes devoted to express traffic has been limited on many of the routes. Air express still is regarded by transport operators as supplementary cargo. In its early stages it hardly earned more revenue than that derived from excess baggage. Today, however, it produces from ten to fifteen times the revenue obtained from transporting passengers' baggage weighing more than the free weight limit.

Express traffic has enjoyed a greater percentage of growth during the past year than any other division of the air transport industry or of the transport industry in general. During the first twelve months, the group handled 43,010 shipments which weighed a total of 429,149 lb. (This figure eliminates duplication in counting shipments passing over more than one line.) If we compare August, 1933, with the same period last year, we find that shipments increased 153 per cent and the poundage 150 per cent.

Since General Air Express, in its first year of operation, transported 46.1 per cent of the total air express business of the country, the study of traffic, based on the records of the organization, can be assumed to be representative.

An analysis of the total number of shipments originated from August, 1932, to September, 1933 (Fig. 1), shows a very substantial growth. At the end of the first month only 2,200 shipments were handled. After the seventh month of operation the number rose to 4,400 shipments and in September of the present year the monthly peak of 5,533 shipments was attained and the trend thereafter has been upward. While the number of shipments handled by individual lines vary from

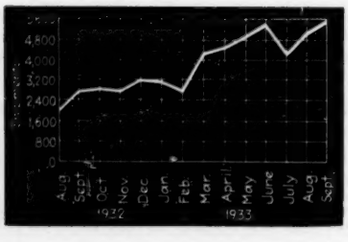

Fig. 1: Monthly variation of the total number of shipments originated shows a substantial increase during the year. The March, 1933, peak in this and curves to follow is accounted for by the large number of currency shipments made during the Bank Holiday.

Fig. 2: An increase in short-haul business is indicated in the monthly study of average distance traveled per shipment.

month to month the variation is similar for the three principal member lines and a relatively even course with some peaks and recessions has prevailed.

The sharp rise in March, 1933, can be attributed to the Bank Holiday when New York City was furnishing currency for the nation. During this period Federal Reserve notes covering entire payrolls were shipped by air express and telegraph companies forwarded to their agents in outlying cities, quantities of cash sufficient to meet their estimated demands. This rush can be detected also by the definite peaks in the charts showing average weight and average revenue. (Figures 3 and 4.)

Long haul or short?

A study of the average distance (Fig. 2) which these shipments traveled is interesting. The average length of haul for the system during the year was 781 miles. Some of the lines, however, have reported a substantial increase in short-haul business. While long hauls in any form of transportation are the most profitable, Transcontinental & Western Air derives a substantial amount of encouragement out of the increase in its short-haul business. In the earlier days of express, it was generally believed that no one would ship a package by airplane in an area that could be reached overnight by train. This has been disproved and an increasing amount of business is now moving in 200 and 300-mile areas, which distances can be covered in two and three hours and where the actual saving in time on very short jumps is a matter of one to four hours.

Weight of shipments

Average weight per shipment (Fig. 3), has shown some tendency to drop during the past year. In October, 1932, the average shipment of one of the member lines weighed 19 lb. By the middle of November the figure dropped to less than 12 lb. It continued at 12 lb. through April and May and, with a slight drop, rose again to 12 lb. in July. Then it dropped off to 8 lb. in August, 1933. On Transcontinental & Western Air, the average shipment weight in 1932 was 14 lb. This quantity gradually decreased to about 10 lb. in January, rose to 15 lb. in April, 1933, and has leveled off since at 11 lb. Eastern Air Transport has handled shipments with weight increasing from 4½ lb. in October, 1932, to 9 lb. in November of the same year, continuing between 5½ to 8 lb. through April, 1933, and then leveling off to 5½ lb. through August.

These variations are very largely accounted for by a very substantially increasing variety of shipments. Sixteen months ago the number of commodities shipped could be counted on the fingers of two hands. To date, there have been more than 300 different items moved by air express. Another very plausible explanation of the drop in the average weight per shipment is the increase in short-haul business which, in the main, consists of smaller packages such as mats, business from advertising agencies, photographs, and lighter materials which are being rushed back and forth between closely situated trade centers in the conduct of a day's business. There are many instances on record where advertising agencies are pre-

Fig. 3: The Bank Holiday peak is also reflected in the monthly curve of average weight per shipment. The trend during the year has been downward.

paring copy and displays, rushing them between such points as New York and Boston, or Washington and Pittsburgh, getting approval of their client, and having the display returned the same day for immediate production.

Included in the rapidly increasing list of commodities are certain items which have become commonplace. Among these are motion picture films, ladies' ready-to-wear, automobile parts, electrotypes, cut flowers, photo plates, cancelled checks, newspaper mats, newspapers, news photos, and advertising matter. Many shippers of these commodities have been brought to a realization of the time saved by using air express in emergencies and since have made regular use of the service. Others, sensing an opportunity to gain a time advantage over competitors, or to increase their distribution range without expensive warehousing, have been quick to apply the principles of fast transportation to the solution of their merchandising problems. In some cases new businesses and new markets, particularly for perishables, have been developed.

Among the daily shippers of automotive parts are General Motors and Chrysler who utilize air express to provide faster service for repair work and, at the same time, reduce the inventories of their distributors. Dress manufacturers are willing to pay a premium to get samples in the hands of their salesmen a few days ahead of their competitors. A New York engraving firm has discovered that its electros could be distributed through the Middle West from Cincinnati less expensively than from New York and has used the air lines to bridge the gap. Cut flowers, sea food, and other perishables have found new and extended markets through air express.

Ninety per cent of the shippers were small scale users. The large shippers, constituting the remaining 10 per cent, were divided almost evenly as to regularity and irregularity. This indicates that the bulk of shipments comes from a very widespread group, providing a broad base on which to build traffic. Of the total traffic almost one-half was provided by large and regular shippers, the remainder coming from comparative infrequent users.

Sixty per cent of the year's business came from the motion picture and printing and publishing industries, the latter accounting largely for the June peak in shipments originated; 20 per cent came from the textile and apparel industries whose ramifications include many separate manufacturing enterprises.

The average revenue per shipment for the system during the year, is $3.97. A peak was reached during the first month of operation when it was nearly $5, and it has gradually fallen off by reason of the large increase in the number of shipments. In August of the present year, however, the average revenue advanced. (Fig. 4.)

The peak of the first month of operation was due in part to the large number of long-haul experimental shipments that characterize the initial traffic of any express system.

Building business

New York City from the beginning has furnished the greatest proportion of gross revenue. the business originated here having constituted an average of 28 per cent of the total. This has been made possible, in a large measure, by the fact that in New York the most serious attempt to interest the public in the use of air express service has been made by creation of a commission sales force which was established about a year ago. Seven men are now devoting their entire time to selling the air shipping idea in Greater New York working on a commission basis. The area has been divided off into districts and each man is given credit for every pound which originates in his district. The group is headed by Maj. L. G. Brower, sales manager. After months of concentrated effort and much foot work, some of his men have developed their territories to a point of production to which they point with pride.

In selling this new type of distribution service to the New York shippers, salesmen use a double contact. Besides the traffic managers of various prospect companies, the sales department is also contacted. The sales manager's viewpoint with regard to delivery is very often different from that of the traffic manager, the latter's job depending in the main on his ability to provide the cheapest and most economical means of transporting merchandise. The former, however, has to consider many sales wherein delivery time is a governing factor. Obtaining the good will of both of these department heads in many concerns has produced unquestionable results.

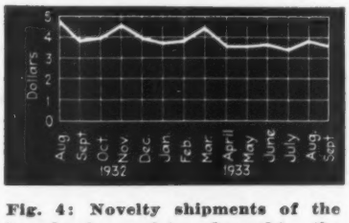

Fig. 4: Novelty shipments of the long-haul variety brought the average revenue per shipment to a peak in the first month of operation. After a downward trend during the first year, the course seems to have turned upward.

The New York sales force of General Air Express. Left to right: Standing, Richard Hawley, H. D. Behr, E. S. Lewis, H. D. Thayer, R. G. Kleinhans. Sitting, Maj. L. G. Brower, sales manager, and E. H. Smith.

Pick up and delivery

One of the outstanding differences in the two existing air express groups is in their pick-up and delivery service. The Railway Express Agency uses its established ground facilities while General Air Express, in its co-operation with Postal Telegraph, has demonstrated the adaptability of messenger service delivery for this type of merchandise. The comparatively light weight shipments are especially suitable for a messenger boy to handle. It has been found that the association of rapidity of telegrams and the handling of air express shipments by a telegraph messenger has had a favorable psychological effect on the shipping public demanding speed. No weight limit is placed on shipments and packages weighing from 100 to 200 lb. are frequently offered. In most of the larger cities, a special air express motor truck operates between the airport and the downtown concentration point where the shipments are divided into routes and dispatched quickly by messenger boys using local transportation.

The telegraph company has also found itself in a position to assist materially in merchandising the air shipping idea. Stickers calling attention to high-speed delivery service of air express have been placed on millions of telegrams calling the service to the attention of a prospective shipper the moment an order is wired in.

What the future holds

It is expected that the year 1934 will show a very substantial increase in air express shipping due to the advent of the new high-speed equipment which will be accompanied by an increase in the number of schedules. This will not only provide much quicker delivery time with overnight coast-to-coast delivery assured on the mid-transcontinental route, but the increased frequency of schedules will provide more cargo space for air express. It is believed that this acceleration of the air shipping movement in general will, by the end of 1934, create a demand in several sections of the country for a specialized service carrying express and freight only.

Several transport operators are already giving serious consideration to utilizing some of the planes which will be superseded next year by the new and faster types as flying freightcars to be operated between principal shipping centers where deliveries can be made overnight without loss of any business time.

In the preceding articles of this series (of which this is the third and concluding installment), Mr. Huntington, recognizing a need for greater standardization in airplane design, framed up, as a point of departure, a general specification onto which the fabric of the airplane of the future might be hung. In this article the author proposes his own answer to the questions he has raised.

Search for an Ideal

PART III

By Dwight Huntington

ILLUSTRATIONS BY THE AUTHOR

Fig. 1

Fig. 2

Fig. 3

Fig. 4

ONE might logically distrust the physician who, after having made his analysis and diagnosis, fails to push his plans for the cure toward a rational conclusion. It behooves us, therefore, to build up, on the basis of the specifications and limitations which we have imposed, some concrete suggestion as to the probable size, shape, and general appearance of the airplane to be developed for the private owner of the future. To begin with, we will make one basic assumption from the analysis (AVIATION, November, 1933, page 349),—our machine will be an amphibion of the long hull type.

Since the basic consideration in design is the relationship between the passenger section of the body and the power plant, or, more specifically, between passengers, engine, and propeller,—the forms and locations of wings, undercarriage, empennage, fuel tanks, and luggage lockers may be laid aside temporarily. Let us therefore consider briefly the relative merits of several of the many hull-powerplant combinations that have been used previously and others suggested by somewhat similar types that have gone before.

Viewing tractor propeller installations first, Fig. 1 is reminiscent of the Keystone-Loening Air Yacht, with inverted Vee engine, and later equipped with an air-cooled radial type. The original installation certainly offered advantages in decreased resistance and increased visibility, as opposed to the lower powerplant weight and increased powerplant reliability of the latter air cooled machine.

Fig. 2 was suggested by an old French Potez land plane in which the engine stood on end, cylinder heads forward, the propeller shaft at right angles to the crankshaft. Here is an ideal installation for cooling an in-line engine since the propeller blast is directed upon the cylinder heads.

Fig. 3 represents the conventional high nacelle-engine installation reminiscent of the Eastman Air Yacht, Keystone-Loening Commuter, and similar designs. The detached nacelle obviously affords the designer a wide range in the choice of engine types.

Fig. 4 shows another overhead engine installation and was suggested by an Austrian Etrich land type monoplane produced in 1914, which utilized an in-line, water-cooled engine. In Fig. 5, a horizontally-opposed engine has been substituted. Such designs encourage the use of windshields set at the best angle for vision forward and downward.

Summarizing, we may conclude that Fig. 2 is superior to Fig. 1, 3, 4 and 5 in several particulars, notably the smaller frontal area of the hull-engine combination, due to a decrease in the depth of the hull and the absence of a nacelle; a lower C.G., requiring less flotation forward and abeam, due to decreased pitching and rolling moments; better visibility forward; increased engine accessibility; and more pleasing lines. Fig. 2 indicates quite clearly, therefore, several of the many advantages made possible by remote drive powerplants as compared with the direct drive type.

Pusher installations

Glancing at pusher installations it is at once apparent that each of Fig. 3, 4, and 5 is capable of a pusher adaptation, by means of a long drive shaft extending across the top deck to the propeller.

Fig. 6 was suggested by the Wright flying boat of pre-war days, in which a six-in-line engine drove twin pusher screws by means of shafting, chains and sprockets. Although shafting and gears to a single screw are here suggested, powerplant reliability admittedly is decreased somewhat by the rather elaborate drive required to attain the good engine and propeller locations shown.

Fig. 7 bears a strong resemblance to the Loening Air Yacht of 1919 and similar subsequent designs. In the former a Liberty V-12 upright engine was used, in place of the inverted in-line engine illustrated which permits of a slightly lower C.G. and increased visibility abaft.

Fig. 8 follows the general hull plan of the original Loening flying boat of 1911. It affords an excellent compromise between the installations of Fig. 6 and 7.

Recalling that Grover C. Loening was chief engineer of the Wright company at the time the ship indicated in Fig. 6 was developed, and that Fig. 1, 3, and 7 also are reminiscent of his designs, one may safely conclude that whatever form the small amphibion eventually assumes, it will bear the unmistakable imprint of his pioneering work.

Fig. 9 is similar to Fig. 8 except that the engine has been on-ended, according to Potez, in order to replace the chain-and-sprocket drive with a simpler, more compact, and more reliable shaft-and-gear drive. Longitudinal hull space is conserved by this arrangement also.

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Fig. 11

Fig. 12

Fig. 13

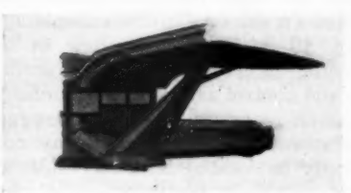

Fig. 14

Fig. 15

Fig. 16

Comparing pusher designs it is readily apparent that Fig. 6, 8, and 9 are superior to Fig. 3, 4, and 5, with shafts to pusher propellers, and to Fig. 7, in such important matters as decreased frontal area, in lower C.G.'s and decreased pitching and rolling moments; in increased visibility and in engine accessibility. Fig. 3, 4, and 5 therefore may be omitted from further discussion.

Before dismissing Fig. 7 let us compare this installation with that of Fig. 9. The former will deliver proportionately more power to the propeller; the latter permits of more efficient engine and propeller speeds and affords a saving in resistance and in propeller power required. Similarly, although Fig. 7 entails no additional weight in drive mechanism, Fig. 9 permits of a sizable saving in engine support weight.

In this connection it is well to bear in mind that a potential purchaser can visualize the constant threat of a dangerously poised engine far more readily than he can follow through the structure provided to carry the engine load around the passenger section in the event of a crash. From the psychological viewpoint at least, a good design rule to follow with reference to engine installation in single-engined ships for land use, would be to keep the engine out of the upper rear quadrant, assuming the foremost occupant's eye as the datum point.

Fig. 7 with its direct drive admittedly appears to be the more reliable installation, yet when one considers the great extent to which reliability of remote drive mechanisms has been developed in other carriers, particularly in automobiles, there is apt to be less hesitancy regarding the general re-adoption of the idea by airplane manufacturers. The original Wright of 1903, it will be recalled, employed remote drive.

Fig. 9 also offers numerous advantages over the installation of Fig. 6. It decreases the length of hull required, with a consequent saving in weight; permits of placing the pilot well in front of the wings and of holding the variable loads nearer the C.G.; the propeller drive is simpler and of less weight; the engine is in a more accessible location; the fire hazard is decreased; and engine fumes are more easily diverted from the occupants.

Making another important assumption at this point—that the simplicity and reliability of the air-cooled engine assures its continued dominance in small private planes, we may conclude that the Fig. 9 installation also affords air-cooling advantages over Fig. 6 and 8.

The installation shown distinctly favors a Vee type engine, which works in admirably with the Vee taper of the hull at this point. Scooping the air directly onto the cylinder heads and into the cylinder alley, and expelling it transaxially across the cylinders through large louvres in the outer cowling, should provide an ideal cooling condition, assuming that conventional transverse, circular cooling fins are used. The unconventional cylinder designs such as the old-style Franklin and the older Gyromotor, with radially disposed, coaxial fins and tube respectively, are also deserving of further consideration in connection with the engine installation of Fig. 9. As a matter of fact, in-line or opposed engines may be used if desired.

Tractor and pusher

Comparing finally the best tractor and pusher installations (Fig. 2 and 9 respectively) reveals that the latter includes many points of superiority such as the greater seaworthiness of the high cruiser bow; better conditions of balance, the variable load being nearer the C.G.; improved vision, the pilot being well

ahead of the wings; absence of the propeller hazard in mooring; increased engine accessibility; decreased fire hazard, and an easier disposal of engine fumes.

Weighing against the superior cooling possibilities of Fig. 2 is the added hull resistance due to the tractor installation. Fig. 9 therefore apparently represents an ideal hull-powerplant combination for the small private amphibion.

Fig. 10 is an interior view of the preceding figure and shows a seating door and control arrangement similar to the coach model automobile. Luggage lockers or collapsible frames may conveniently be located on either side, aft of the rear seat, the intervening space being reserved for use in working on the engine. Access to this after compartment may be facilitated by designing a central section of the rear seatback to open forward.

Assuming that a diesel engine is used, the exhaust manifold located behind the crankcase in vertical position, with silencer above the manifold exhausting to the rear of the streamlined gearhousing support above the wing, thereby avoiding possible sounding-board effect, it is difficult to see how the general arrangement of Fig. 10 could be greatly improved. The fuel tanks could be placed in the hull, underneath the flooring. Should a gasoline engine be utilized, however, the stub wings probably would provide a more acceptable location for the tanks.

Secondary considerations

Proceeding with the secondary design considerations, which govern the planning of side flotation, undercarriage, and wing units, it is at once apparent that these are capable of collective as well as individual treatment.

In the matter of side flotation, two tried and proved systems are available; individual floats, and Dornier type fins. Much could be written in favor of each system, yet the latter appears to offer one big advantage in providing an excellent and broad support for the principal undercarriage wheels. Fig. 11 illustrates this point. It is assumed, of course, that the general design of the undercarriage will carry out the suggestions previously made, which will place the ship normally in level position and will bring the main wheels back approximately in line with the C.G. of the loaded ship. Although I have merely indicated vertical retraction of the wheels to exposed positions above the fins, careful design probably could sink the wheels in wells provided in the upper surfaces of those members, completely retracted. Watertight, flatsided, metal disk wheels with flat metal tires, and more resilient riding shock absorbers, are worthy subjects of investigation in connection with the type of gear shown.

Three wing combinations suggest themselves: (1) biplane; (2) parasol monoplane internally braced, and (3) the parasol monoplane externally braced. In the light of the preceding analysis this superficial study favors the last. One factor weighing against the biplane is its excessive height once ample water clearance for the lower wing has been provided.

Wing bracing

Several considerations favor the externally braced wing over the internally braced variety. Among them autogiro competition and a general debunking of landing speed mythology call for a downward revision of wing loadings and relatively larger wing areas. Thus attention is focused on the sesquiplane type of structure developed by Bellanca which is an excellent compromise between biplane and internally braced monoplane. Wing shock absorbers also are on the way and I hazard the guess they will be more readily applicable to externally braced structures than to those braced internally.

In order to provide adequate height for the external wing truss, either a raised center section or gull type stub wings are necessary. The latter offer advantages in visibility abaft, in appearance, and perhaps, in aerodynamic efficiency. Assuming that advantage is taken of the Dornier fins for anchoring the lift struts, the gull type stub wings may well be designed of sufficient span to permit of a folding wing arrangement, enabling the propeller to swing clear with wings in folded positions. Fig. 12 suggests this arrangement of Dornier fins and gull type stub wings.

This figure also carries the suggestion of propeller guards in the form of reminders,—small arc-shaped stubs protruding from the hull chines in the plane of the propeller disk. These can be seen of course even when the propeller is swinging and thus they might occasionally function as life savers.

Fig. 13 is a further development of the general arrangement suggested and includes shallow doors and deck hatches. Although it is not contemplated that the doors will be used on the water, they certainly are advisable for land use to obviate excessive climbing, and for that reason watertight sills are entitled to serious study. Favoring vision forward and downward are small ports let into the hull immediately below the windshield wings. The small triangular decks thus formed may be used to advantage as steps in gaining access to the forward deck, for mooring purposes and disembarking.

Other advantages illustrated are the exceptionally good visibility for the pilot; the feasibility of using the Dornier fins as decks for purposes of boarding or of working on the engine with cowls removed, and the ability to fold the wings after mooring, if desired, without disturbing the side flotation system.

Fig. 15 adopts the Bellanca style of rigid, lifting-surface wing strut, a well-known feature of the Airbus. Assuming that tapered wing panels are used in conjunction with the Dornier fin anchorage, a very efficient wing truss should be possible. The old, sensible objection to designs which render the wing truss vulnerable to undercarriage fractures can be met by designing the Dornier fins well above the load factors for the undercarriage struts.

Fig. 15 is an air view of our hypothetical ship and indicates that the general design lends itself to pleasing lines.

Fig. 16 illustrates that the wings in folded positions need not interfere with access to the cabin or with rotation of the propeller. Thus it is entirely feasible for a man to taxi such a ship out of the hangar, lock the wings in flight position and take off, without the assistance customarily required by ships of similar capacity.

Summarizing, it appears that if we equip a Loening type hull with Dornier fins, install a Vee type engine in Potez fashion, and brace Bleriot monoplane panels by means of Bellanca lift struts, etc., we may have the essentials of a really good airplane.

The ideal private plane

Some readers may sense subtle humor in a criticism of the large variety of airplane types which concludes with an offer of one more variation. Nevertheless I believe they have yet to gaze upon a private airplane designed solely upon the basis of thorough, impartial analysis.

Let us suppose that the most experienced and capable aircraft designers collectively were to make a thorough analysis of the private airplane of the size herein discussed. They would take every ideal condition into consideration, listing all desirable qualities in the order of importance and the manner in which those qualities influenced the design of each unit. Improvements hoped for would be mixed with those possible of immediate attainment as grist for the mill. The result would be a conclusive agreement as to what constitutes the ideal airplane, and an unerring ability to select all that is meritorious from the past as the substantial basis for a design anticipating the future.

Capable studies of such subjects as powerplant arrangement and remote drive, propeller location, visibility, mushability, undercarriage design, folding wings and wing shock absorbers, airworthiness, seaworthiness, crash and fire hazards, etc., would encourage a searching analysis of present designs.

Certainly the present is an auspicious time for the industry to weigh the anchor of professional jealousy and to proceed to a thorough analysis of design fundamentals.

Blue Eagle Takes Wing

Codification of the Air Transport Industry under the NRA an accomplished fact.

WITH the affixation of the Presidential signature the proposed Code of Fair Competition to govern the air transportation industry becomes effective on Nov. 27. As anticipated in our review of the Code hearings (AVIATION, October, 1933, page 312), the measure in its final form incorporated two important provisions. First, the pilots, as a professional class are exempted from the workings of the code. Their troubles have been aired elsewhere under the aegis of the National Labor Board. Second, the drastic rulings of the original drafts with respect to new competition on any route have been modified to prevent any appearance of absolute monopoly for existing air lines. True, the Code Authority (including government appointees Earl Hughes, Deputy NRA Administrator; W. W. Howes, Assistant Postmaster General; and E. L. Vidal, Director of Aeronautics) must pass upon application of new-comers for permission to set up operations. The primary object, however, is to make certain that no unfair competition shall arise from operators depending upon rate cutting, starvation wages to employees, unsafe practices, or seasonal operation for their profits. Monoplies are not guaranteed, but it is necessary that new competitors entering a given territory meet the "standards and conditions" to be established under the code. The intent has been to secure adequate control of competition without crippling development and sound expansion.

General Johnson, in presenting the final code draft to the President for approval, pointed with pride to the probable effect on employment—an increase of about 15 per cent in personnel, 20 per cent in total payroll. Where the extra two or three million dollars a year is to come from was not touched upon. The letter of transmittal, which outlines some high spots of the code provisions, is herewith given in full, followed by the full text of the code:

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Letter of Transmittal

Nov. 10, 1933

THE PRESIDENT
The White House

Sir: This is a report of the Hearing on the Code of Fair Competition for the Air Transport Industry of the United States and the Territory of Alaska, conducted in Washington on the 31st of August, 1933, in accordance with the provisions of the National Industrial Recovery Act.

Provisions of This Code as to Wages and Hours

Maximum hours for employees are established as follows: Clerical employees—40 hours per week. Shop mechanics and shop mechanics' helpers—40 hours per week averaged over a period of four weeks, with a maximum of 48 hours in any one week. Service mechanics and service mechanics' helpers—48 hours per week averaged over a period of eight weeks, with a maximum of 54 hours in any one week. Ground radio operators and field clerks not more than 48 hours in any one week. Watchmen—54 hours in any one week. Chauffeurs—48 hours per week averaged over a period of six weeks with a maximum of 54 hours in any one week.

No employee shall be paid less than at the rate of $15 a week. Provision is made that rates of pay for employees whose hours of employment have been reduced by the provisions of this Code shall be increased by a readjustment so that equitable differentials in earnings will be maintained and the rates of pay of employees whose hours have not been reduced shall not be decreased.

Employment of any person under sixteen years of age and anyone under eighteen years of age at occupations hazardous in nature or dangerous to health is prohibited.

In recommending the approval of the hour provisions of this Code it has been necessary to recognize that air transportation is a public service requiring 24 hours per day operation throughout the year and that its schedules are continouusly subject to interferences by weather conditions.

Economic Effect of the Code

The Air Transport Industry represents an exception in the present depression in that it has added to its personnel and expanded steadily from year to year. Its personnel increased from about 1,861 in 1929 to about 4,260 in June, 1933. Under the recommended Code the Industry will show an additional increase in personnel of about 14.5 per cent. The total increase in payroll will be about 20 per cent. It is considered that this is a substantial contribution to the Re-employment Program in view of the fact that the Post Office Department's mail payments, which form the largest item of the air line income, have been reduced approximately 28 per cent for 1933.

Through the provisions of this Code the Industry has an opportunity to provide for the control of new operations so that it will not be subject to uneconomic paralleling of lines and the destructive competition experienced during the course of development by the railroads and bus lines.

It is believed that the provisions in this Code permit adequate control and at the same time insure development and sound expansion.

Findings

The Administrator finds that:

(a) The Code as recommended complies in all respects with the pertinent provisions of Title I of the Act, including, without limitation, sub-section *(a)* of Section 7, and sub-section *(b)* of Section 10 thereof; and that

(b) The applicant group imposes no inequitable restrictions on admission to membership therein, and is truly representative of the Air Transport Industry; and that

(c) The Code as recommended is not designed to promote monopolies or to eliminate or oppress small enterprises and will not operate to discriminate against them, and will tend to effectuate the policy of Title I of the National Industrial Recovery Act.

From evidence adduced during this hearing and from recommendations and reports of the various Advisory Boards, it is believed that this Code as now proposed and revised is satisfactory to this Industry, labor, the public, and this Administration. It is recommended, therefore, that this Code, as herewith submitted, be approved.

Respectfully,
HUGH S. JOHNSON,
Administrator

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Text of the Code

Article I: Purpose

To effecutate the policies of Title I of the National Industrial Recovery Act the following provisions are established as a Code of Fair Competition for the Air Transport Industry, and upon approval by the President shall be the standard of fair competition for such Industry and shall be binding upon every member thereof.

Article II: Definitions

As used in this Code:

1. The term "President" means the President of the United States.

2. The terms "Act" and "Administrator" mean, respectively, the National Industrial Recovery Act, and the Administrator of Title I of said Act.

3. The term "Industry" includes all public carriers for hire by aircraft for passengers, and/or mail, and/or cargo on scheduled operations and services incidental thereto within the several states of the United States, the District of Columbia, and the territory of Alaska and such branches or sub-divisions thereof as may from time to time be included by the President under the provisions of this Code, but does not include scheduled operations and/or services incidental thereto not within the several states of the United States, the District of Columbia, and the territory of Alaska.

4. The term "employee" includes any person engaged in any phase of the Industry in any capacity, receiving compensation for his services, irrespective of the method of payment of such compensation.

5. The term "employer" includes anyone engaged in the Industry by whom any employee is compensated or employed.

6. The term "member of the Industry" includes anyone engaged in the Industry as above defined, either as an employer or on his own behalf.

7. The term "Chamber" means the Aeronautical Chamber of Commerce of America, Inc., a trade association organized under the laws of the State of New York.

Article III: Hours

1. No employee in the Industry shall be permitted to work in excess of 40 hours in any one week except as follows:

(a) Shop mechanics and shop mechanics' helpers not more than 40 hours per week averaged over a period of four weeks, with a maximum of 48 hours in any one week.

(b) Service mechanics and service mechanics' helpers not more than 48 hours per week averaged over a period of eight weeks, with a maximum of 54 hours in any one week.

(c) Ground radio operators and field clerks not more than 48 hours in any one week.

(d) Watchmen not more than 54 hours in any one week.

(e) Chauffeurs not more than 48 hours in any one week averaged over a period of six weeks, with a maximum of 54 hours in any one week.

(f) The number of employees classified as ground radio operators, field clerks, and watchmen shall not exceed 15 per cent of the total number of employees of any employer.

2. No employee shall be permitted to work for a total number of hours in excess of the number of hours prescribed herein whether employed by one or more employers.

3. No employee shall be regularly employed more than six days in any seven-day period.

4. The provisions of this Article shall not apply to any employee on emergency maintenance or emergency repair work involving accidents endangering life or property, nor to persons who receive more than $35 a week employed in a managerial, executive or professional capacity, or as pilots or co-pilots.

[While it is clear that Article III has been framed in such a way as to prevent any reduction of the effectiveness of the Code through wholesale reclassification of employees, it is equally plain that the way is open for all emergency work with a bearing on the safety of life or property. There is nothing in the Code that might be construed as an excuse for any slackness in maintenance of equipment.

Although Par. 1(c) limits ground radio operators to 48 hours in any one week a certain degree of ambiguity exists regarding the status of the personnel of remote radio and weather reporting stations whose duties, although intermittent, necessarily cover 24 hours a day. Are they to be exempt under the emergency clause, or will it be necessary to triple the number of persons so engaged?]

Article IV: Wages

1. No employee shall be paid less than at the rate of $15 a week.

2. The rates of pay of all employees included in Article III whose hours of employment have been reduced by the provisions of this Code, but whose wages have not been increased by the foregoing section of this Article, shall be increased by a readjustment so that equitable differentials in earnings will be maintained, and the rates of pay of such employees included in Article III whose hours have not been reduced shall not be decreased.

3. Those employees included in paragraph *(a)* Article III above who work in excess of eight hours per day, or in excess of 40 hours per week, and those employees included in paragraph *(b)* Article III above who work in excess of 48 hours per week, shall be compensated by not less than 1½ times the normal rate of pay for such excess. All other employees on emergency maintenance or emergency repair work involving accident endangering life or property shall receive at least time and ½ pay per hours work in excess of the maximum hours herein provided.

4. Any employee shall be classified according to the classification of his occupation existing on June 16, 1933, provided he is still performing the same duties. If he is performing other duties, he shall be classified as to occupation on the basis of such duties as of said date.

[Although there is no limit to the amount of overtime that may be put on emergency repair work under Art. III, Par. 4, it is specified that persons engaged in such work shall be paid 1½ times their normal rate for the excess time put in over and above the maximum time normally specified. For shop and service mechanics (whose hours under Art. III are limited to 40 and 48 a week respectively), overtime in any given week must be compensated at not less than 1½ times the normal rate even if the hours are shortened in following weeks to bring the eight-week average down to specified levels.]

Article V: Labor Provisions

1. Employees shall have the right to organize and bargain collectively through representatives of their own choosing, and shall be free from the interference, restraint, or coercion of employers of labor, or their agents, in the designation of such representatives or in self-organization or in other concerted activities for the purpose of collective bargaining or other mutual aid or protection.

2. No employee and no one seeking employment shall be required as a condition of employment to join any company union or to refrain from joining, organizing, or assisting a labor organization of his own choosing.

3. Employers shall comply with the maximum hours of labor, minimum rates of pay, and other conditions of employment, approved or prescribed by the President.

4. No person under sixteen years of age shall be employed in the Industry nor anyone under eighteen years of age at operations or occupations hazardous in nature or dangerous to health. The Code Authority shall submit to the Administrator before March 1, 1934, a list of such occupations. An employer shall be deemed to have complied with these provisions if he shall have on file a certifiate or permit duly issued by the Authority in such state empowered to issue employment or age certificates or permits showing that the employee is of the required age.

5. Within each state this Code shall not supersede any laws of such state imposing more stringent requirements regulating the age of employees, hours of work, or general working conditions than under this Code, nor shall it supersede the provisions of the Air Commerce Act of 1926, or any regulations issued thereunder or pursuant thereto.

Article VI: Administration

To effectuate further the purposes of the Act, a Code Authority is hereby set up to co-operate with the Administrator in the administration of this Code.

1. The Code Authority shall be composed of seven voting members and one or more non-voting members. Not more than five voting members shall be chosen by the Chamber. Not more than two voting members may be chosen by those assenting to the Code who are not members of the Chamber. One or more non-voting members may be appointed by the Administrator to serve without cost to the Industry. The method of selection of the voting members of the Code Authority shall be subject to the approval of the Administrator.

2. Any trade or industrial association participating in the selection of or activities of the Code Authority, shall comply with the following requirements: *(a)* it shall impose no inequitable restrictions on membership, *(b)* it shall not violate any rule or regulation prescribed by the President under the Act, and *(c)* it shall submit to the Administrator true copies of its articles of association, by-laws, regulations, and amendments when made thereto, together with such other information as to membership, organization, and activities as the Administrator may require to effectuate the policies of this Act.

3. The Administrator may provide such hearing as he may deem proper for those claiming the right to be represented on the Code Authority, and may thereafter change the method of selection and the organizations selecting the members of the Code Authority, in order that the Code Authority shall be truly representative of the Industry.

4. An appeal from any action by the Code Authority affecting the rights of any employer or employee in the Industry may be taken to the Administrator.

5. Only employers assenting to this Code shall be entitled to participate in the selection of the Code Authority and to share in its activities as hereinafter set forth.

6. The Code Authority shall have the powers and duties elsewhere provided in this Code, subject to the right of the Administrator, on review, to disapprove or modify any action taken by the Code Authority.

(a) To elect officers and assign to them such duties as it may consider advisable, and to provide reasonable rules for its own procedure.

(b) To receive complaints of violations of this Code, make investigations thereof, provide hearings thereon and adjust such complaints, and bring to the attention of the Administrator for prosecution, recommendations and information relative to unadjusted violations.

(c) To require periodical reports from the members of the Industry with respect to revenues, expenses, and other charges, wages, hours of labor, conditions of employment, number of employees, and other matters pertinent to the purposes of this Code, in order that the President may be kept informed with respect to the observance thereof. In addition to the information required to be submitted to the Code Authority as set forth in this Article there shall be furnished to government agencies such statistical information as the Administrator may deem necessary for the pur-

poses recited in Section 3 *(a)* of the National Industrial Recovery Act.

(d) To recommend to the Administrator a uniform system of accounting which upon his approval shall be used in furnishing the aforesaid reports.

(e) To initiate, consider, and submit proposals for amendments or modifications to this Code, which upon approval by the President, after such hearings as he may prescribe, shall be incorporated herein with the same force and effect as if originally made a part hereof.

(f) To determine and collect with the approval of the Administrator, from those assenting to the Code, their equitable and proportionate shares of the expense of maintaining the Code Authority and its activities.

(g) To co-operate with the Administrator in regulating the use of the NRA insignia solely by those who have agreed to and do comply with this Code.

7. Nothing contained in this Code shall constitute the members of the Code Authority partners for any purpose. Nor shall any member of the Code Authority be liable in any manner to anyone for any act of any other member, officer, agent or employee of the Code Authority. Nor shall any member of the Code Authority be liable to anyone for any action or omission to act under the Code, except for his own willful misfeasance or non-feasance.

[In writing the air transport code a difficulty has been avoided that has caused some dissention in other industries. According to usual practice, the government has reserved the right to appoint one or more non-voting members to the Code Authority, but in this case it is specifically stated that no expense therefrom shall accrue to the industry. The commissioner (or commissioners) so appointed will presumably serve voluntarily, or be paid by the government. The actual number of governmental representatives is apparently unrestricted, but as indicated in the first paragraph on page 369, three men have been appointed.

Although the powers vested in the Authority with respect to the collection of reports and statistics are very broad, there is little likelihood that any immediate steps will be taken to institute any radical changes in the already established channels through which statistical information now flows. Probably one of the first, and perhaps the most important measure to come up for consideration, will be the revision of the uniform system of accounts now imposed on mail carriers by the Post Office Department.

The Code Authority has no powers to make new rules, nor to enforce any regulations not specifically covered by the Code. Any employer or employee operating under the code has recourse to appeal to the NRA Administrator in cases of dispute concerning rulings of the Code Authority. The Administrator has broad powers of control over the make-up and organization of the Authority to insure that it is truly representative of the industry at all times.]

Article VII: Trade Practices

Within 60 days from the date of approval of this Code with respect to existing routes, and within 30 days after the establishment of any extension of an existing route, and prior to the establishment of any new route or service, each member of the Industry shall file with the Code Authority the following:

1. A certified copy of a letter or certificate of authority to operate, issued by the United States Department of Commerce permitting service over such route or extension thereof.

2. Such information in respect to routes, schedules, tariffs, working conditions, and other matters pertinent to the purpose of this Code as the Code Authority with the approval of the Administrator may from time to time prescribe in order to inform the President as to the observance of this Code.

3. Evidence of compliance with such standards and conditions of operation, other than those required by the Department of Commerce, as the Administrator upon the recommendation of the Code Authority after such notice and hearing as he shall prescribe, may approve as reasonable and in the interests of fair competition.

[The Code Authority thus has an effective weapon in hand against the irresponsible or fly-by-night operator, in its powers to require the attainment and maintenance of certain "standards and conditions" of services offered. It will be noted that the rules laid down by the Department of Commerce are the *minimum* requirements, and the NRA Administrator, acting on the recommendations of the Authority, has full power to promulgate such additional rules as may seem reasonable and in the interests of fair competition. The presumption is that the standards and conditions specified will relate to reliability and safety of service and treatment of personnel.]

Article VIII: General

1. This Code and all the provisions thereof are expressly made subject to the right of the President, in accordance with the provisions of sub-section *(b)* of Section 10 of the National Industrial Recovery Act, from time to time to cancel or modify any order, approval, license, rule or regulation issued under Title I of said Act and specifically, but without limitations to the right of the President to cancel or modify his approval of this Code or any conditions imposed by him upon his approval thereof.

2. Nothing in this Code shall permit monopolies or monopolistic practices or eliminate or oppress or discriminate against small enterprises.

3. Each member shall post in a conspicuous place in each workshop a full copy of this Code.

4. This Code shall become effective on the second Monday after it shall have been approved by the President of the United States.

Nov. 1, 1933

Private Charter Services

By Edward V. Reith

INCREASING public pressure to fly to towns not served by the regular air line creates a definite place for the private charter service, but prospective passengers on trips of this sort should realize that the cost per mile of chartering a plane must of necessity be greater than the cost of a ticket for the corresponding distance on an air line. He must beware of the fly-by-night operator who is willing to cut prices to any level simply to get business. In talking prices the reliable operator will have one fixed price for any given job, and should be willing to explain that his charge includes storage, fuel, insurance, maintenance, pilots, sales and depreciation costs, as well as a reasonable percentage of profit. With such an operator clients are reasonably certain that the planes are well maintained and the pilots who fly them are capable and conservative.

Fortunately, the cut-rate operators almost invariably eliminate themselves. They are a decided menace to the conscientious and businesslike operator, however, because they are constantly entering the business, donating their capital to the experiment, and departing with the statement that "aviation does not pay." They are fortunate indeed if their departure is not accompanied by a serious crash involving the loss of equipment and lives.

Another source of unfair competition to the established charter services comes from the hired pilots of wealthy private owners, who are permitted to rent out their planes and services when the ship is not required for the owner's use. Having no overhead to meet, they can naturally offer services at rates much under those quoted by legitimate operators. Usually the owner is not aware of such usage, but if he is, he may welcome whatever income is derived from this source to offset his hangar storage charges. There are laws to prevent privately owned automobile competition with taxicabs, and it might not be a bad idea to make some similar discrimination between the airplane owned for pleasure and the one maintained for purely business purposes.

In bringing to a conclusion his interesting series of articles on Italian military aviation, Commander Scaroni traces the development of pursuit and training types. His long and intimate connection with Italian military aviation, including wartime service as a pursuit pilot, several years in the United States as Air Attache of the Italian Embassy, and active command of field and base units, have furnished an unusually good background against which to sketch the current status of Italy's air forces for American readers.

The Equipment of Air Forces

ITALY (PART III) PURSUIT AND TRAINING

By Comdr Silvio Scaroni

IN THE FIELD of bombing and observation there are indications that theory and practice are tending to come closer and closer together. Once the specific requirements have been clearly stated, it is relatively easy to produce machines to fulfill them. Experts are pretty generally in agreement as to the function of bombers and observation planes in future wars, but the manner of employment of the single-seat fighter is still a moot question.

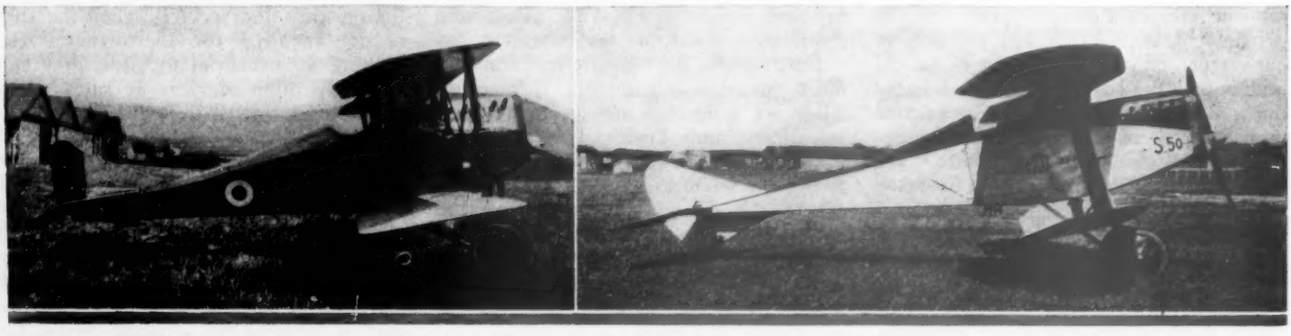
Of course, a very general specification is easily written. A single-seat fighter must have the highest possible speed in flight and in climb, it must provide the best possible vision for the pilot. Its maneuverability must be unquestioned at all flight speeds, and it is desirable to have the largest possible range of action. Trouble develops, however, when an attempt is made to properly proportion these general and sometimes conflicting characteristics. In final analysis, the proportion of each of the desirable properties depends on the usage to be made of the airplane, and it is on this fundamental point that experts all over the world hold widely divergent opinions, as witness the number of types now in existence. Mr. C. G. Grey writes in the *Aeroplane* that "the Royal Air Force possesses by far the best single-seat fighter in the world." Some of Mr. Grey's contemporaries in other countries have been known to take issue with him on this point, for they hold their own designs in just as high regard. It is not my intention to enter into the argument as to the superiority of one nation's fighters over another. Each has faced the problem from a different angle, and naturally has obtained different results. English tactics center about the defense of London, a problem which requires a highly specialized type of aircraft. The American specifications are radically different and, obviously, the solution adopted could not be the same. Italy's problem concerns the defense of her most important industrial centers, which in many cases are located close to frontiers. Where England's industries are concentrated in a few square miles of area, however, Italy's are spread out along a line of hundreds of miles. In this respect our problem is much more similar to that of the United States than of England and, therefore, our single-seat fighters have grown to resemble American types much more than they do Britain's interceptor class.

One feature in which we are definitely interested is the attainment of high altitude and, to promote research in this direction, General Balbo has been developing at Montecelio a special research laboratory for studying the behavior of airplane engines in the stratosphere.

Pursuit history

Turning back the pages of history, it will be recalled from a previous chapter, that the development of Italian pursuit planes lagged the bomber by some three years and the reconnaissance plane by approximately one year. In 1918 Ansaldo of Turin produced the first Italian pursuit, designated officially as the A.1 but popularly as the Balilla. The performance of this machine compared very favorably with that of the SPAD.XIII supplied to Italy by France during the last part of the War. The armistice arrived, however, before the Balilla was produced in large numbers. [For an interesting account of Balillas on active service, read "Wings Over Poland," by Kenneth M. Murray, reviewed in AVIATION, December, 1932.]

A contemporary of the Balilla was the S.50, designed by Marchetti and built by Savoia-Marchetti. This machine was a single-strut single-bay biplane with the fuselage hung midway between the upper and lower wings



Wartime Pursuit. Left: The Balilla by Ansaldo which put in an appearance late in 1918, and which armed the Italian Pursuit squadrons until 1923. Right: An unconventional arrangement designed by Marchetti in 1918 which never went into production due to the acceptance of the Balilla.

A Record of Progress—The C.R. series by Fiat. Above: Successor to the Balilla, the C.R.1 of 1923. Note the typical N strut arrangement of Rosatelli, and the negative overhang which disappeared on later models. Above, right: The C.R.20 of 1925, which, in modified and improved forms is still in active use in some pursuit squadrons. Right: A modern version, the C.R.30. Note improvements in undercarriage, and the tunnel type radiator. An active service type.

[somewhat similar to the wartime Bristol fighter]. It was powered with a 220-hp. SPA engine. With the adoption of the Balilla for service squadrons, however, the S.50 disappeared from the picture. In the period of political disorder which immediately followed the War no further designs were produced and the Balilla remained the only single-seat fighter in service until 1923 when it was replaced by the Fiat C.R.1.

Designed by Rosatelli (originator of the B. R. bombing series), this machine was a rigid biplane with marked negative overhang. In construction it was conventional for the period, except that the engine mount was made of steel instead of the usual wood. Later (1925), after Fiat had developed a new 12-cylinder water-cooled engine (the A.20, —410 hp., at 2,060 r.p.m.), Rosatelli designed another single seater for the Air Force, the C.R.20. A biplane like its predecessor, it differed materially in detail, the entire framing of the fuselage and wings being constructed of steel. The performance was greatly improved over the earlier design. The maneuverability was very good and the machine was strong enough to withstand all types of acrobatic maneuvers as well as sustained dives at full throttle.

The greater part of Italian fighting units today are equipped with the C.R.20 although, since 1925, many substantial improvements have been made. A great deal of attention has been given to matters concerning the comfort of the pilot especially for flights at high altitudes. The under-carriage has been modified so that it is now of the open type with oleo-pneumatic shock struts. Some of the latest machines are fitted with a new Isotta Fraschini V-type air-cooled engine, the Asso Caccia of 440-hp. Others are equipped with the A.20 Fiat engine which has an unusually high compression ratio, and which must use a fuel consisting of a mixture of gasoline, alcohol, and benzol.

Left: In a class by itself, — the M41 single - seat flying boat fighter which first appeared in 1930, and which is still in active naval service.

A sea fighter

In 1930 appeared a fighter of novel type, the M.41 bis, single-seat flying boat. Two fighting squadrons were equipped with these machines at that time. They are still in service. Naturally, the plane cannot compete with a land fighter but it has been found very useful for certain cases in the naval field. It was designed by Castoldi, who built the plane which won the Schneider cup at Norfolk, Va., in 1926. It is a biplane of very clean line, fitted with a 410-hp., water-cooled Fiat engine mounted as a pusher. With this arrangement it is unnecessary to carry the additional weight of gun synchronizing gear, as the forward field of fire is not obstructed by the propeller. As indicated by the table, the M.41 bis ranks well up among the land type for speed and carrying capacity and exceeds its nearest competitor by one full hour in flight duration.

By 1931 progress in the design of bomber and reconnaissance types had reached a point where their speeds were equal to or better than the best pursuit of the late 1920's, and it was obvious that the fighting ships must be pushed to higher speeds if their effectiveness was to be retained. In 1932 Fiat introduced the C.R.30, another Rosatelli design, to meet the new requirements.

At a single step top speeds were pushed from 168 m.p.h. to 227 m.p.h. The general form of the C.R. series was retained but an all-metal construction was adopted. The power plant is a geared Fiat normally developing well over 600 hp. at 2,600 r.p.m. of the engine shaft (1,610 r.p.m. at the propeller). The compression ratio is 8. Its two banks of six cylinders are arranged in a V at an angle of 30 deg. The dry weight is 1,047 lb., including hub, synchronizing gear, and gasoline pump.

Pilot vision in the C.R.30 is very good, and, although its speed has been tremendously increased, its maneuverability has not been greatly reduced. With its efficiently-arranged armament, speed, and maneuverability, the C.R.30 makes a formidable competitor for any military plane now in existence. Incidentally, one of these machines won the international speed contest for military planes in Switzerland in 1932.

Although details are lacking at the time of this writing, it is known that Breda, Caproni, and Fiat are all working on new designs in the pursuit class, some of which may be ready for public exhibition by the end of the year.

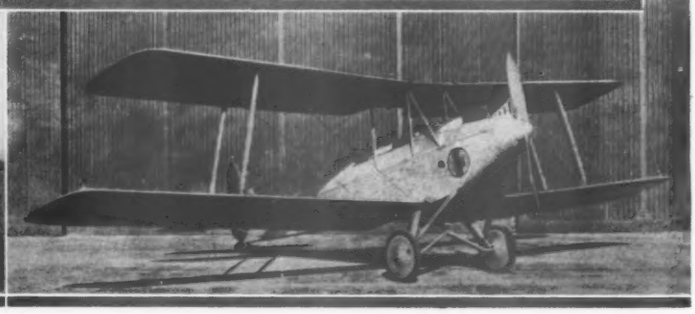
Trainers

Flight training in Italy dates back to 1911, when Caproni developed a monoplane school type machine. Shortly afterward Gabardini (1913) produced a training biplane on which, at his flying school at Novara, opened in 1914, he had instructed over 1,500 pilots by the end of the War. His machine has to its credit a crossing of the Alps in 1914. Since the War the basic type has

On this curious type of machine Gabardini trained some 1,400 military pilots for Italy during the early War years.

Italy's standard secondary school machine, the Breda 25.

A group of Primary training planes. Above, right: The original Fiat A.S.1. Above: The Fiat A.S.2, a more modern version of the A.S.1. Below: The Romeo 5. Right: A cabin type trainer, the Breda 15. Below, right: The Caproni 100 bears a certain resemblance to the D.H. Moth except for the pronounced negative stagger.



SINGLE-SEAT FIGHTERS

Name	Year of construction	Engine	Horsepower	Weight empty (lb.)	Useful load (lb.)	Maximum speed (m.p.h.)	Service ceiling (ft.)	Range (hr.-min.)	Climb feet / min.-sec.
Balilla (A.1)	1918	Spa 6.A	220	1,411	540	136.7	.....	2:30	.....
C.R.1	1923	Hispano Suiza	300	1,850	694	169.0	24,440	2:35	16,400/16:27
C.R.20	1925	Fiat A.20	420	2,134	864	171.5	26,250	2:50	16,400/13:35
M.41 bis‡	1929	Fiat A.20	420	2,579	948	162.8	22,960	4:00	16,400/18:00
C.R. Asso	1930	I.F. Asso. Caccia	440	2,209	926	156.6	26,250	3:00	.....
C.R.30	1932	Fiat A.30r	600*	2,778	1,268	226.8†	26,740	2:30	19,690/13:00

‡Flying boat. *Nominal. †At 11,480 ft.

TRAINING MACHINES

Name	Year of construction	Engine	Horsepower	Empty weight (lb.)	Useful load (lb.)	Maximum speed (m.p.h.)	Minimum speed (m.p.h.)	Range at full throttle (hr.-min.)
Caproni	1911	Anzani	35	485	364	43.5	....	...
Gabardini	1913	Le Rhone	80	816	331	102.5	....	3:00
Fiat A.S.1	1929	Fiat A.50	90	904	617	98.2	45.0	5:30
Romeo 5	1929	Fiat A.50	90	926	617	108.7	46.6	5:00
Breda 15a	1929	Colombo S.53	85	970	617	100.7	46.6	5:00
Caproni 100	1929	Fiat A.50	90	941	617	97.6	40.0	5:00
Caproni 100	1929	Isotta Fraschini	90	941	617	97.6	40.0	5:00
Breda 25	1930	Lynx	220	1,654	551	127.4	43.5	3:00

been converted into some eight different sub-types, the last of which was still in service in 1930.

A number of concerns built primary and secondary types of machines following the War,—including Caproni, Breda, Macchi, Cantieri di Trieste, Ansaldo, and S.I.A.I. Their ships were powered with engines ranging from 40 to 250 hp., with speeds ranging from 43 to 155 m.p.h. Machines for the third or advanced training stage, which was then in force, were almost invariably service types belonging to the obsolescent category.

In 1929 General Balbo appointed a military commission to make a thorough study of flight training methods, and to draw up a set of standard specifications for training machines. Up to this time each aviation school had been left to provide for its own needs in the way of methods and equipment. Under this system had developed a fantastic situation, in which seven civilian aviation schools (all private enterprises) were using something like 30 different types of machines for the three stages in which flying courses were then divided. The first step was to reduce the training curriculum from three to two parts, a primary and a secondary stage. This made possible the evolution of two types of machines only, one for each stage.

Besides the decision of the commission to reduce the training to two stages, considerable study was made of the problem of simplifying the flying material and reducing the cost per flying hour. It was necessary to standardize on equipment and if possible to obtain machines which could be easily converted from primary to secondary training equipment by simply changing such parts as wings, elevator, rudder, or engine.

This study was hampered somewhat by two divergent schools of thought which were in evidence at that time. One trend was to make a training plane difficult to fly, in order to make it possible to eliminate unsuitable pilot material from the very beginning. The second on the other hand, inclined toward a machine easily flown, so that the largest possible number of pupils might be brought to the solo stage. Finally, a compromise was reached somewhere between the two extremes and it has been specified that, for the primary period of instruction, the speed range of airplanes shall be between 40 and 87 m.p.h., and for secondary types, from 53 to 124 m.p.h. Both types, however, must be capable of performing all forms of acrobatics, either solo or dual, and must be so constructed that pilots can get clear of the cockpit easily and quickly in any flight altitude.

Further details were specified. The commission favored biplanes and, from a standpoint of economy, recommended either composite or all wood types of construction. Gravity fuel systems were to be adopted on account of simplicity and practicability. Other questions to be considered were low cost of construction and repair, simplicity of construction, and ease of assembly and disassembly.

As far as engines were concerned, the Commission indicated a preference for air-cooled types. In-line or V-cylinder arrangements were to be preferred over the radial type, on account of their lesser susceptibility to damage in nose-over landings. For primary training it was suggested that engines be of 130 hp. at 1,600-1,700 r.p.m., and should weigh from 2.8 to 3.5 per horsepower. For the secondary stage, engines should develop approximately 230 hp. at 1,600-1,700 r.p.m., and should weigh 2.6 to 3.3 lb. per horsepower. In each case the gasoline consumption should be approximately .52 lb. per hp.-hr. at 90 per cent of full throttle r.p.m.

Design competition results

As a result of a design competition instituted by General Balbo's Commission against the specifications outlined above, a number of machines were presented for both categories. Out of the group in the secondary class, the Breda 25 was selected as the best. This is a biplane of composite construction fitted with a Lynx engine built by Romeo of Milan. The fuselage is of welded steel tubes covered partly by duraluminum and partly by doped fabric. The undercarriage has oleo-pneumatic shock absorbers, and the wheels are fitted with brakes. Tail surfaces are of fabric-covered welded steel. Both fin and stabilizer are adjustable. The vision is good from both seats, and both cockpits are clear of obstruction so that the pilot wearing a parachute may leave easily and quickly. With a safety factor of 11 for the entire ship, it may be safely subjected to the entire range of acrobatics.

In 1929 another design competition was promoted by the Air Ministry for sport machines which could be used also as a cheap means of training reserve pilots. Out of the seven or eight presented by the industry, four were selected, the Fiat A.S.1, the Romeo 5, the Breda 15, and the CA.100. The first three were monoplanes and the last a biplane. Of this group, the CA.100 and the A.S.1 were later selected as primary training machines, not only on account of their flying ability, but on account of their economical construction and maintenance.

The CA.100 is a rigid biplane of composite construction, fabric-covered. Some of these machines are fitted with an Isotta Fraschini engine of 80 hp., and others with the Fiat A.50, a radial engine of 90 hp. Both engines had been developed as a result of the Air Ministry's design competition mentioned above. The A.S.1, on the other hand, is a monoplane of composite construction (wood and welded steel), the fuselage being covered by plywood and the wings by doped fabric. In common with the CA.100, it has folding wings.

Again, although full details are not available, it is understood that the Breda 15, the Fiat A.S.1, the Romeo 5, and the CA.100 have undergone considerable improvement recently, and that certain other new planes for training purposes are now under test.

The above covers the current picture as far as machines are concerned. As to personnel, it might be mentioned that all pilots assigned to the various offices of the Air Ministry, or to other departments not connected with the fighting units, are formed into special squadrons and continue their flying practice on standard types of training machines modified for improved performance.

Fig. 1. A three-bladed, 11 ft. 6 in. propeller of Navy design was used in the tests on the Curtiss-Wright Condor.

A comparison of flight test results with several types of controllable pitch propellers

Pitch Control

By

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IN COLLABORATION WITH

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MODERN airplane design is affecting propeller characteristics in such a way that controllable pitch propellers are becoming essential to satisfactory all-around performance. Designers are calling for geared engines with slow-turning propellers to get quiet propeller operation and high propulsive efficiencies. The result is the use of large-diameter, large-blade-area propellers which must be set at high pitches, if fixed-pitched, because of the high forward speeds of the airplanes. The blades then operate during take-off and low-speed flight in an attitude near their stalling point, slowing down the engines to a speed where they develop considerably less than the rated power.

With the twin-engine transport that is so popular today, there is a further demand for an adequate ceiling with one engine inoperative. Performance under this condition is greatly benefited by the use of controllable pitch propellers, especially when the propeller of the dead engine is feathered to reduce its drag. Thus, in order to obtain good take-off and climb, and, on the twin-engine airplane, good single engine ceiling, the controllable pitch propeller is necessarily becoming standard equipment on the modern airplane.

Flight tests and supplementary calculations have brought out several other advantages of controllable pitch propellers, when of the multi-position type, in their improvement of high speed at altitude and cruising speed with unsupercharged engines at altitude. The results of the flight tests of several airplanes with Curtiss controllable pitch propellers are analyzed here to show what improvement can be expected.

Table I: Performance of Curtiss-Wright Condor T-32

The Curtiss-Wright Condor here used is the original model similar to those in Service and not having the further aerodynamic improvements now being incorporated in the latest units. Gross weight, 16,800 lb.; two Wright Cyclones, GR-1820 F-2, Geared 8:5, 720 hp. at 1,950 r.p.m. at 3,000 ft.; three-bladed propellers, 11 ft. 6 in. diameter. (Blade settings used in each case are indicated in parenthesis).

Type of Propeller	Fixed Pitch	Two Position	Four Position	Multi-Position
		High Speed		
Sea level (m.p.h.)	170	170(1)	170(2)	170
3,000 ft. (m.p.h.)	174	174(1)	174(2)	174
5,000 ft. (m.p.h.)	173	173(1)	173(2)	174
10,000 ft. (m.p.h.)	168	168(1)	168(2)	171
		Cruising Speed		
Sea level (m.p.h.)	145	145(1)	145(2)	145
3,000 ft. (m.p.h.)	149	149(1)	149(2)	149
5,000 ft. (m.p.h.)	148	148(1)	148(2)	151
10,000 ft. (m.p.h.)	143	143(1)	163(1)	163
		Rate of Climb		
Sea level (ft./min.)	1,060	1,320(2)	1,320(3)	1,390
3,000 ft. (ft./min.)	1,020	1,280(2)	1,280(3)	1,350
5,000 ft. (ft./min.)	900	1,180(2)	1,180(3)	1,220
10,000 ft. (ft./min.)	620	880(2)	880(3)	920
		Ceiling		
Service (ft.)	19,300	22,800(2)	22,800(3)	23,600
One engine (ft.)	3,000	6,700(2)	6,700(3)	8,000
		Take-off Zero Wind		
Sea level (ft.)	980	700(2)	650(4)	625

Blade settings used and conditions determining them

Fixed Pitch

30 deg. ..... 1,950 r.p.m. at 3,000 ft. (level flight).

Two Position

(1) 30 deg. ..... 1,950 r.p.m. at 3,000 ft. (level flight).
(2) 24 deg. ..... 1,950 r.p.m. at S. L. at 98 m.p.h.
1,950 r.p.m. at 8,000 ft. at 97 mp.h.

Four Position

(1) 34.5 deg. ..... 1,725 r.p.m. at 10,000 ft. at 480 hp. (level).
(2) 30 deg. ..... 1,950 r.p.m. at 3,000 ft. (level).
(3) 24 deg. ..... 1,950 r.p.m. at 8,000 ft. at 97 m.p.h.
(4) 22.8 deg. ..... 1,950 r.p.m. at S. L. at 65 m.p.h.

Multi-Position

All angles available for maximum performance. Dead propeller feathered to 90 deg. during single engine flight. Pitch 21.0 deg. at start of take-off run, 22.8 deg. at end of run.

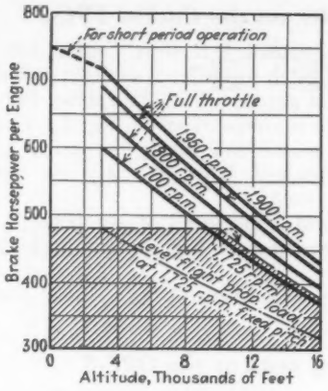


Fig. 2. Altitude characteristics of the Wright Cyclone GR-1820 F-2 geared engine. For cruising operation horsepower must lie inside the shaded area and engine speed must not exceed 1,725 r.p.m.

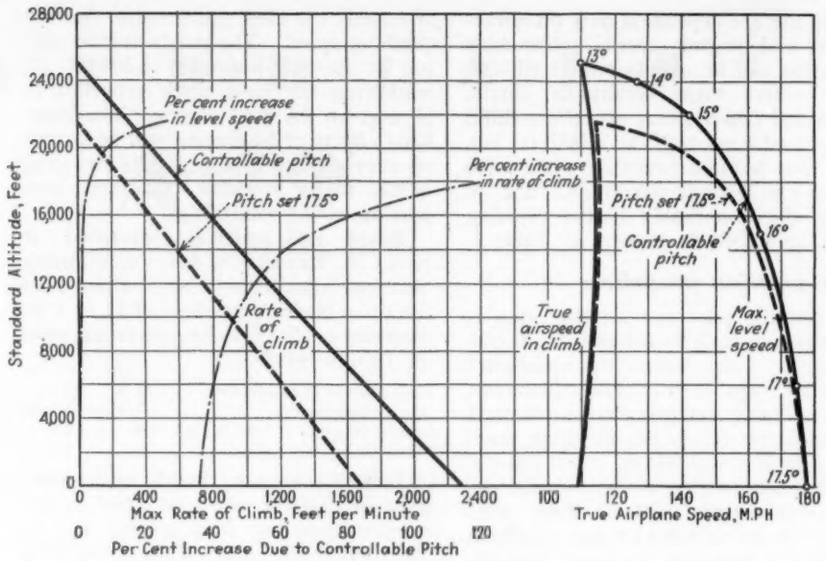


Fig. 3. Comparative performance of Curtiss Controllable pitch propeller on the F9C-2 airplane (2,788 lb. gross). A two blade, 9 ft. diameter, propeller on a Wright R-975 engine, developing 420 hp. at 2,200 r.p.m., was used.

Fig. 4. The mechanism of the Curtiss-Wright propeller is electrically controlled and provides a pitch change of 1 deg. every three seconds.

The most extended series of trials was made on the Curtiss-Wright Condor, tested by the Flight Test Section of the Curtiss-Wright Airplane Company, St. Louis, Mo., with several types of engines and propellers, including a Curtiss controllable-pitch type as illustrated in Fig. 1. In order to give all the performance on a strictly comparable basis with the propeller as the only variable, the data of Table I have been worked up from the flight test data. The performance is for the airplane with two Wright GR-1820 F-2 geared engines, developing 720 bhp. at 1,950 r.p.m. at 3,000 ft. with power curves as in Fig. 2. The three bladed 11 ft. 6 in. propellers of Navy Design No. 5550 with a large blade area were found to give the highest efficiency at high speed, and the blade form, size, and section were the same for all the propeller conditions compared in Table I.

Further aerodynamic refinements being made at the present time on the Condor have not been taken into account in Table I. The performances given apply essentially to the standard Condor now in service.

Most of the items tabulated in Table I speak for themselves, but "cruising" always requires definition. In this case the cruising condition is taken as limited both by power and by r.p.m., the former being held to a maximum of 480 hp. or two-thirds of the engine's rated power, and the latter held to 1,725 r.p.m. Thus at low altitudes the cruising condition is determined by the limit on engine output, while at high altitudes (the critical point of change depending on the type and pitch of the propeller) engine speed replaces power as the limiting factor.

Fixed-pitch propellers

At fixed pitch, the propellers had to be set at 30 deg. to absorb the 720 bhp. at 1,950 r.p.m. in level flight at 3,000 ft. The engine speed falls off in full-throttle level flight at higher altitudes so that, at 10,000 ft., it will be only 1,870 r.p.m. This results in a corresponding loss of high speed at altitude. The critical point for cruising, where engine speed replaces power as the limiting factor, is at 3,000 ft. In cruising at altitudes above 3,000 ft., the power absorbed by the fixed-pitch propellers at 1,725 r.p.m. is closely proportional to the relative air density and follows the curve so marked in Fig. 2.

Two-position propellers

One blade angle of the two-position type of controllable-pitch propeller is picked to favor low-speed flight; the other, high-speed flight. In the low-speed conditions encountered in these tests, it would have been desirable to have the engines turn 1,950 r.p.m. full throttle at the following airplane speeds:

65 m.p.h. at sea level for best take-off.

98 m.p.h. at 8,000 ft. for single-engine flight.

110 m.p.h. at all altitudes for best climb.

With only one pitch to take care of these three conditions, the 24 deg. setting, which corresponds with the single-engine condition, is chosen as the best compromise. The high pitch is set at 30 deg., as on the fixed-pitch propellers, for full-throttle level flight at 3,000 ft. The high speeds and cruising speeds will then be identical with those of the fixed-pitch propellers. Higher cruising speeds at high altitudes can be obtained by increasing the high pitch-angle as will be shown below, but this practice is not altogether desirable with two-position propellers because of the loss of speed and cruising speed at low altitudes.

Four-position propellers

A four-position type would give two blade angles for the low speed conditions and two angles for the high speed cruising speed conditions. Since take-off and single engine flight are considered most important of the low speed conditions, the first blade angle setting is picked at 22.8 deg. to give full power at 65 m.p.h. for take-off. The second is selected at 24 deg. to provide full power at 98 m.p.h. for single-engine flight. The 30 deg. angle of the fixed-pitch propeller is the third position intended to take care of high speed and cruising operation at low altitudes, and the fourth position, reserved for cruising at 10,000 ft. is 34.5 deg. to absorb 480 bhp. at 1,725 r.p.m.

The recommended cruising condition at 3,000 ft., with fixed pitch propellers, was stated previously as 480 bhp. at 1,725 r.p.m. Since bearing wear and

engine life are dependent only on horsepower and engine speed, satisfactory operation can be maintained at all altitudes where these conditions obtain. Fixed and two-position propellers fulfill these conditions only at 3,000 ft. but, with four-position propellers, one pitch setting can be selected at 34.5 deg. to obtain the remarkably higher cruising speed at 10,000 ft. shown in Table I.

Multi-position propellers

When the pilot can set the pitch to the optimum position for each flight condition, as in the case of the multi-pitch propeller, capable of infinite adjustment, the maximum performance is obtained. It should be noted that the high speed at sea level and 3,000 ft. is not affected by any controllable pitch propeller installation when the basic fixed pitch propellers are selected for this condition. At higher altitudes, however, the airplane speed is improved with the multi-pitch propeller because the blade angle can be continuously decreased to permit full throttle operation always at 1,950 r.p.m.

In cruising at 1,725 r.p.m. the pitch is continuously increased with altitude so that the engine output is always 480 bhp., as indicated by the intake manifold pressure. This technique gives an appreciable improvement in the cruising speeds at altitude. (Table I.) The propulsive efficiency at the 34.5 deg. setting is very high in cruising.

Thus the multi-pitch propellers with engines supercharged to 3,000 ft. give the same cruising speed at 10,000 ft. as can be obtained with engines supercharged to 10,000 ft. since, in either case, the engines will be cruised at 1,725 r.p.m. and 480 bhp. To the transport operator, this should be an important advantage because of the increased reliability of the engine and the fuel economy gained through using lower impeller speeds in the supercharger.

Rate of climb and service ceiling are improved because the blade angle of the multi-position propellers can be set at exactly the ideal position for the best climbing speed. The single engine ceiling is further improved 1,300 ft. by feathering the multi-pitch propeller to 90 deg. on the dead engine. The beneficial effects of feathering will be largest on very clean airplanes where the drag of the idling propeller is a large proportion of the total drag.

Based on material presented in N.A.C.A. Report No. 464, the following characteristics have been determined for the three-bladed propellers of 11 ft. 6 in. diameter on the Condor, assuming same as Design 4412.

Blade angle at .75 radius (deg.)	21.5	88
Tj — locked propeller	—.023	—.0014
Drag at 98 m.p.h. at 8,000 ft. (lb.)	176	10.7
Thrust horsepower consumed	46	2.8

This 43 excess thrust horsepower gives 88 ft./min, climb or 1,600 ft. difference in ceiling. It is possible that on the Condor the drag of the idling propeller is less than that of the locked propeller because it is three-bladed. The 1,300 ft.-difference is therefore in good agreement with the N.A.C.A.

For take-off with the multi-pitch propellers, the blade angle is set at 21 deg. at the start of the run and is slowly increased to 22.8 deg. as the ship leaves the ground so that the engines always turn 1,950 r.p.m. The electric control on the Curtiss controllable pitch propeller was designed for this condition with its speed of operation of 1 deg. every three seconds. Furthermore, the pitch adjustment with the electric control stops automatically at any angle set by the pilot on the instrument board indicator so that he is not given additional cares during the take-off.

Propeller on the Curtiss F9C-2

A two-bladed, 9 ft. 0 in. Curtiss controllable pitch propeller was flight tested some time ago on a F9C-2 airplane. Performance is summarized in Fig. 4. The results, which are much the same as those obtained more recently on the Condor, are:

Identical high speed at sea level.

Improvement of high speeds at high altitudes.

Large improvement of climb and ceilings.

Take-off tests of the O2C-2

Flight tests were made of a Curtiss O2C-2 "Helldiver" airplane using a two-bladed 9 ft. 9 in. propeller with the pitch adjustable on the ground. The take-off data (corrected to zero wind) for this airplane at a gross weight of 4,250 lb., with a Wright Cyclone R-1820E engine (640 bhp. at 1,900 r.p.m.), are:

Table II

Propeller pitch (deg.)	19.4	15.5
Ground r.p.m.	1,600	1,820
R.p.m. in 90-knot climb	1,700	1,950
Take-off run, zero wind (ft.)	450	320
Reduction in take-off run (per cent)	...	33

Generalized effects

When multi-position controllable pitch propellers are installed on an airplane in place of fixed-pitch propellers designed and pitched for high speed at the critical altitude of the engine supercharging, the following improvements in performance can be expected on the normal airplane:

TABLE III

High speed at critical altitude	No change
Cruising speed at critical altitude	No change
Cruising speeds at higher altitudes	Same as 7,000 ft. of additional supercharging
Take-off run	Reduced 30 per cent
Rate of climb at critical altitude	Increased 30 per cent
Service ceiling	Increased 4,000 ft.
Single engine ceiling on twin engine airplane	Increased 5,000 ft.*

*1,300 ft. of this figure is due to feathering the blades of the dead propeller.

Encouragement for the Private Flyer

BELIEVING that many holders of private licenses ultimately lose interest in simply flying about their home airport and making practice landings, R. U. St. John, manager of the San Francisco Bay Airdrome, at Alameda, Cal., has been very successful in promoting small air tours to nearby localities, where events of special interest may be in progress. By flying in groups pilots thus get a considerable amount of cross-country experience, without the danger or inconvenience that sometimes accompanies attempts to go off on their own.

Mr. St. John is an enthusiastic flyer himself, and has done much to promote pleasure flying in his territory by organizing and leading such short excursions as these.

To keep people informed as to schedules and possibilities for such trips, a mimeographed bulletin is issued monthly. For example, the October issue suggests that the football season offers opportunity for many pleasant week-end excursions to games away from home, and also that many good hunting localities may be reached easily and quickly by air. Such places are listed, and the names and general conditions of the nearest airport noted. A supplementary list gives the dates, places, and airports of special events in all parts of California.

The more or less formal annual or semi-annual tours organized by aviation country clubs and certain of the larger fields in the east are familiar, but airport managers may find pleasure and profit to be gained by adopting a regular program similar to that carried on by Mr. St. John at Alameda.

EDITORIALS

AVIATION

EDWARD P. WARNER, *Editor*

$700? And How?

IT IS FREQUENTLY a matter of some little difficulty to pick the particular story which deserves the pre-eminent position of our news pages, but this month there could be no doubt. The announcement from the Department of Commerce that Director Vidal has undertaken to solicit expressions of willingness to buy a new airplane of specified characteristics, and that the characteristics include a price of $700, has set the high-water-mark in news excitement not only for November but for a much longer period. Upon the Department of Commerce there descends a host of messages, dividing themselves neatly into two groups. Stripped of excess verbiage, one group reads: "How soon can we get delivery?"; the other: "How come?"

Within the aeronautical industry as outside, there are enthusiasts and there are skeptics. There are those who cheer the scheme, those who denounce it, and those who ridicule it, but we have yet to find anybody that is simply indifferent. Applause and denunciation and ridicule all have one point in common; all are founded quite largely on misunderstanding. No doubt all three sentiments would still exist, but they would exist in a considerably more enlightened form, if there were a more general comprehension of what Mr. Vidal and his associates are trying to do.

For a long time now we have been speculating on the private market. A real drive to sell private airplanes was made in 1929, but as we look back it appears that the prices were too high and the facilities for servicing and use too undeveloped to make the test a conclusive one. In 1931 another trial was made, with the price barrier much lower and the emphasis on the light planes. That one flopped because the planes failed to catch the public fancy. But even at that time, and ever since, one has periodically heard non-owners expressing their willingness to buy without delay "if only there were available at a low price a real, sound, factory-built product with nothing cheap in its appearance and so distributed that you could count on proper servicing."

SO FOR several years we have lain in the doldrums and private airplanes have been in the specialty class, individually sold to a comparatively small number of purchasers. The industry has been unable to develop a mass production airplane without being assured of a mass market; the market, having no ultra-low-priced airplanes upon which to focus an expression of interest, remained silent and invisible. Each of the essential parties to the development of large-scale private ownership waited upon the other. Each group remained hidden in its own trenches, and the No Man's Land between them remained uncrossed.

Now Mr. Vidal sets about to bring them together by a triumph of compound hypothesis. To the potential purchaser he says: "Assume that an airplane which I shall describe exists. What would you do then?" And then he turns immediately to the industry and inquires: "Assuming that you can get orders right now for 10,000 standardized airplanes of small size and relatively low performance and low price, what kind of a ship could you offer and what would the figure be?" *IF* all goes well it may prove that the first group will give satisfactory proof of their willingness to place orders in numbers as large as those which the manufacturers have been asked to assume, and that the manufacturers will declare their willingness to build a machine of the type described at the price which the potential purchasers have been asked to assume. At that point the Director of Aeronautics can step gracefully back out of the center of the picture and announce to both groups that the assumptions that he asked them to accept have now become facts, and that it remains only for them to get together and carry on as per their conditional promises. The conditions imposed will have been realized. The manufacturers will have declared themselves ready to build the planes. The purchasers will have declared themselves ready to buy them. And it will only be necessary for both groups to go ahead and make good on their declarations.

THE IDEA is amusing in its very simplicity. The industry may not sell 10,000 airplanes, or even any large part thereof, but at least we shall have a lot of new information. Aside from some temporary unsettlement of the market for existing types of aircraft, we believe the results will be good. But there is a word of caution that should be said, and a point that should be made.

Extreme care must be used in interpreting the results of the market survey. We assume that the Department of Commerce will use such care in its own interpretation, but there is always danger that where simple figures are given they may be misunderstood or misapplied by those who get hold of them without the interpretation or who elect to pay no attention to the restrictions and explanations with which they are surrounded. The total number of replies to a questionnaire is usually a small fraction of the number that receive it, and those replying are not always a fair sampling out of the whole number. The enthusiasts about a subject are most likely to take the trouble to express themselves. Furthermore, a mere declaration of willingness to buy, unaccompanied by any explanation of the conditions under which a plane would actually be used or any guarantee of good faith in the matter, must be subject to a certain percentage of discount. There are plenty of people who will gaily write "Yes" on a piece of paper, but who will not be nearly so ready to write their names at the bottom of checks for $700 each. Analysis of the returns, and personal examination of a few sample cases, can go far to determine what the percentage of discount should be. All that must and assuredly will be taken into account as the Department personnel prepare to make their interpretations.

But there is another point. We believe that 10,000 airplanes of excellent quality could be built for $700 apiece by a single manufacturer who received a single order for the 10,000 machines. They cannot be built for any such price under the conditions that existed in 1929, with about 180 manufacturers scrambling over each other after every individual sale and with no single factory getting up to a production of more than a few hundred ships. Since the objections to enforced monopoly in this field are manifest, and since there is no way to get the benefit of mass production on airplanes without actually producing a large number of a single type, an essential condition precedent to the successful accomplishment of the Vidal plan is that the aircraft industry should cooperate as no industry has ever cooperated before. The airplane of which 10,000 are to be built at a $700 price would have to be designed as the Liberty engine was designed during the War, to represent the experience and the best thought of a group coming from many sources. It would have to be turned out in many plants, perhaps with wings built at A and landing gears at B and assembly taken care of at C and D, and then it will have to be the subject of a concentrated sales campaign in which all effort is merged to get as many people as possible into the air. We don't know that that can be done. There are obvious obstacles of the gravest order. We do know that something very much like it would have to be done to make good on the Vidal plan, and that is one of several matters upon which the aircraft industry should reflect, meditate, and ponder as this inquest into willingness to buy progresses.

For want of a horseshoe nail

THE phenomenal growth of American airlines during the past few years is a matter of record. We point with pride to mounting totals in passenger-miles flown and in tons of goods carried. Luxurious airlines, intricate communication networks and strategically located shops and stations for maintenance and repair bear witness to the courage and foresight and persistent effort that have built up a new transportation system through years of unparalleled business depression. The technique of airline operations is now reasonably well understood, and matters which were formerly in highly experimental categories have settled down to routine. With that much accomplished, it is time to pause for a little salubrious self-examination lest any tendency develop to rest on our laurels. It would almost certainly be fatal to the entire program of development if routine were permitted to engender carelessness through even the slightest degree of relaxation of watchfulness anywhere along the line. Routine cannot replace individual attentiveness and a highly developed sense of individual responsibility.

As is usually the case, the greatest dangers may lurk in apparently insignificant things. Many of us may remember from the days of our early youth the very moral little tale of how a battle was lost because a horseshoe nail turned up missing at the psychological moment. Now that the basic campaign for air transport development has been worked out and is more or less in running order, it is time to be thinking about horseshoe nails. A little chunk of caked mud in a retracting gear mechanism, a control secured by straps when it should be free, or an almost invisible mark on a propeller blade—of such are the horseshoe nails upon which the ultimate outcome of the battle may easily depend. Public confidence in aircraft is not the fragile thing it once was, but it would not survive the impact of many thrilling adventures apparently brought to pass by obviously careless practices.

Time-tables, servicing periods, maintenance schedules and what not may be established and enforced by mathematical formula and by fiat, but in the final analysis success or failure rests solely with individuals. Everyone concerned, from the highest operating official down to the youngest beginner in the shops, must realize that the lives of passengers and pilots, and so the chances of survival not only of his own company but of the entire air transportation scheme, are in his hands. He has a unique responsibility.

In air line operation one mistake is one too many. To deserve the continued increase of public confidence and public patronage we must constantly meet two extraordinarily difficult specifications. First, every individual must do his job PERFECTLY. Second, every individual must NEVER fail to keep his eyes open and his wits sharpened even beyond the strict bounds of his own responsibility. Anything short of that is a clear invitation to mishap.

STATISTICS OF THE MONTH

Supplementing the statistical issue of AVIATION, *March, 1933. Page numbers refer to that issue.*

AIR TRANSPORT
(Page 60)

Scheduled Domestic Operations
First Eight Months 1933

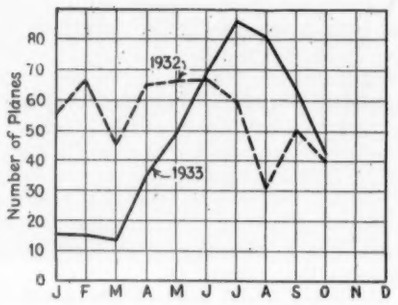
Miles flown	32,487,101
Passenger-miles	108,408,620
Express carried (lb.)	906,891
Mail carried, domestic (lb.)	4,764,150

UNDER the impulse of improved service and faster schedules, the acceptance of the airlines as a normal means of transportation made phenomenal gains during the summer of 1933. As shown in an accompanying chart, the passenger mileage for August jumped from some 15,936,000 for 1932 to 22,489,000 in the current year. The effect of travel to and from the World Fair at Chicago is readily discernable in the tremendous increase which took place in June. It will be noted that airplane miles were not increased in the proportion shown by passenger miles. Obviously, the number of passengers per plane is increasing and the average passenger is making longer trips. The average for the first six months of the year was 327 miles per trip against the best previously recorded figure of 282 miles for the period July to December, 1932.

Preliminary figures for the month of September put passenger miles in the neighborhood of 20 million, airplane miles about 4.2 million. The seasonal decline is in evidence.

Elsewhere in this issue (page 363) will be found a detailed discussion of the character and growth of the air express business. Another chart on this page, however, shows the mounting totals for 1933 as compared with the figures for a year ago. Preliminary gains to about the 130,000 lb. level. Evidently the trend continues upward.

Although the monthly poundage of air mail carried has shown a steady increase during 1933 back to the level attained during the first six months of 1932 (before increased postal rates cut seriously into the volume), the current outlook is complicated by uncertainties at Washington and to an ever-decreasing return to operators per mile flown. In spite of reduced revenues, so far there have been few curtailments of services, and it is likely that the figure of $0.35 per mile reached in September will show little, if any, decrease for the balance of the year. The sharp dip in rate for June, 1932, came about from the fact that more than eleven-twelfths of the appropriation for the fiscal year had been used up during the preceding months and the operators simply had to take what was left in payment for their June services. A similar drop occurred in June, 1933, but unfortunately there was no July recovery as in preceding years.

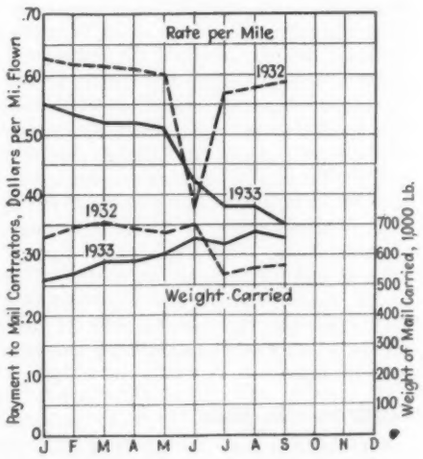


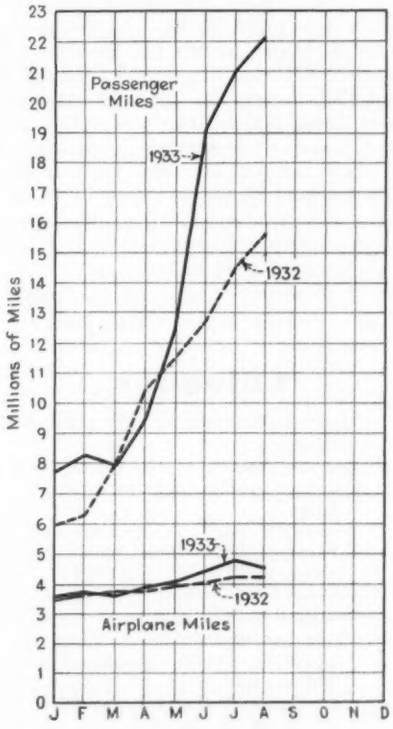
Planes licensed or identified for the first time.

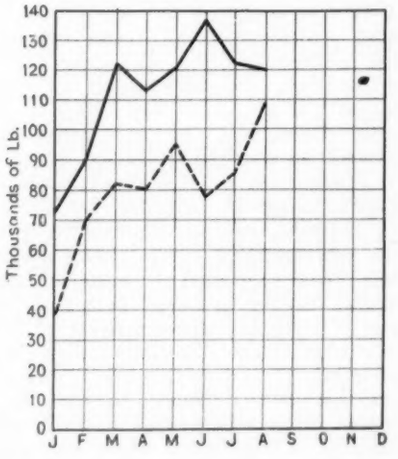
How long the operators will continue to maintain services at the present levels is a matter for conjecture.

PRODUCTION AND LICENSING
(Page 77)

THE CURVE of aircraft production for 1933 (as indicated by airplanes licensed or identified for the first time) followed the normal seasonal pattern much more closely than did the curve for 1932. Although the early part of the year was well below the 1932 level, the gains made during the spring carried through well into the summer so that it is likely that the total number of units produced this year will be very close to the 1932 figure. As in previous presentations, the curves of the accompanying charts are based on an average month of 4⅓ weeks and include only the products of regular manufacturers, excluding the home builder and the maker of purely experimental aircraft.







Left: The air mail situation,—tonnage up, revenue down. Center: Air transport patronage continues to climb. Right: More goods travel by air express. (Basic data for curves corrected to a uniform length month to avoid irregularities arising from varying number of days in calendar months)

NEWS OF THE MONTH

$700 private plane

CONFIDENTLY believing that private flying can be built up to justify at least a fraction of the bright hopes of 1929, Aeronautics Branch Director Vidal this month conceived an idea, initiated a survey. The idea is that if a well-finished, high quality, factory-built airplane could be sold well under $1,000 there should be many purchasers. Director Vidal suggests the possible price of $700 for the airplanes. The survey is to determine how many purchasers there might be.

Director Vidal believes the price of $700 could be made for a two-passenger, low-wing monoplane with a maximum speed of 100 m.p.h. and a landing speed of 25 m.p.h. secured by the use of wing flaps on condition that 10,000 could be quickly and easily sold. Built entirely of metal, the plane's structure would closely parallel automobile factory practice. To discover the 10,000 customers, questionnaires have gone out to 34,000 licensed pilots, mechanics and holders of student permits. To each go the questions: Would you purchase a plane of the order described if it could be made available in the near future? If the answer is *No*, please give your reasons. First week's replies netted 5,642 allegations of willingness to buy, 2,019 rejections.

Wages of pilots

While schemes were devised in Washington whereby pilots now licensed might continue to fly, discussion raged furiously in New York concerning the conditions of employment of professional pilots who fly the transports for leading airlines. Though the appointment of the fact-finding committee (AVIATION, November, page 354) was supposed to lead swiftly to final settlement of all issues between the airlines and the Air Line Pilots Association, the total result to date leaves the situation very much as it was a month ago. At the hearings, the committee, comprising Justice Bernard L. Shientag of the New York Supreme Court, Lester D. Seymour, and David L. Behncke, received statements from the representative of the airline operators (who supported the adequacy and justice of the proposed new scale of pay), from the representatives of the Air Line Pilots Association (who denounced it), from Director Vidal of the Aeronautics Branch of the Commerce Department (who flatly denied hazards of high speed flying and unequivocally supported the hourly basis of pay).

The fact-finding commission produced a singularly colorless report, declaring their inability to reach an agreement and suggesting "that the rates proposed by the operators should continue without prejudice to the contentions of the respective parties, pending a prompt, thorough, scientific investigation of hours of employment, wages and working conditions in the industry to be made by a governmental agency to be designated by the National Labor Board." As this was exactly the sort of investigation that the fact-finding committee itself had been expected to make, the report sounded like a proclamation of incapacity or unwillingness to do the job, which, to be sure, would have been a heavy one. The National Labor Board, after one look at this document, rejected it and instructed the committee to present data to enable the Board to make its own findings. In the meantime, the Labor Board ruled that the pay scale retroactive to October 1 will still hold. For the present at least all lines will continue to pay on the new standardized scale. First pilots now receive for base pay the first year $1,600, rising $200 per year to $3,000 in the eighth year, and thereafter. The trip pay, varying with the cruising speed of the planes, ranges from $4 per hour (125 m.p.h. cruising speed) to $5 per hour (speeds over 200 m.p.h.) with a $2 per hour bonus for night flying. Co-pilots receive $190 per month for the first six months, $210 for the second six months, and $225 thereafter. Thus, a first-year pilot flying 900 hours during the year, 40 per cent of it at night and assigned a plane with a cruising sped of 160 m.p.h. would receive a salary of $6,460. As a veteran pilot of more than seven years standing he would earn $7,860.

The pilots' fight to be excluded from the provisions of the Air Transport Code (AVIATION, October, page 311) was won on Nov. 15, when President Roosevelt signed the code from which they were exempt.

Calendar

December—International Rally, Cairo, Egypt.

Dec. 14—Meeting of the Federation Aeronautique Internationale, Cairo, Egypt.

Dec. 16-17—Pacific International Air Pageant, Curtiss-Wright Field, San Mateo, Cal.

February — Viceroy's Challenge Trophy 700-mile race, Delhi, India.

Feb. 9-13—Pan-American Races—Dedication Shushan Airport, New Orleans, La.

April 27-May 6—International Show of Sport & Touring Aviation, Geneva, Switzerland.

May 27—Deutsch de la Meurthe Cup Race.

Services await P.W.A.

One month after announcement of the allotment of $15,000,000 for Army and Navy aircraft, no news of the actual release of funds or placing of contracts has yet been forthcoming. Though special efforts have been made to create an aviation staff for the administration of Public Works Fund, none as yet has been appointed. However, P.W.A.'s allocations to the Aeronautics Branch, Department of Commerce, to date will go far toward modernizing the airways. Of its recent allotments of $452,700 (AVIATION, November, page 354) and $499,125, which total $951,825, the Aeronautics Branch will spend $720,125 for relocating airways lighting equipment, establishing radio-range beacon stations and installing blind-landing equipment. $225,000 will go for 30 new airplanes to replace obsolete craft, while the remaining $6,700 will be used for an intermediate landing field at Fort Plain, N. Y. The National Advisory Committee for Aeronautics received $47,944 for repairs to the storm-wrecked laboratory at Langley Field, Va. (AVIATION, October, page 328). Part of the Navy's $8,961,052 for shore establishment projects will be spent on the air bases at Coco Solo, C. Z., Pearl Harbor, Hawaii, Newport, R. I., Quantico, Va. $14,500, representing a 10 per cent increase over the original authorization, was granted to the Navy Bureau of Yards and Docks for improvements at the San Diego Air Station. Other Navy expenditures are $11,425 for the Philadelphia aircraft factory, $3,500 for the air station at Pensacola, and $170,700 for repair of storm damage. The Air Corps, War Department, which received $1,383,442 for construction projects, will spend $1,500 for night lighting in Brooks Field, Tex.; $20,986 for the completion of the Air Corps hangar at Chicago; $6,000 and $9,700 for gasoline storage systems at Post Field, Okla., and Marshall Field, Tex., respectively. $1,125,285 was allotted to the War Department for repairs to storm-damaged properties. The U. S. Coast Guard has been granted $1,895,000 for the purchase of 31 seaplanes, as well as $1,160,000 for five new air stations.

Seadrome in sight

The application for an allocation of $1,500,000 for experimentation with a quarter-section of a seadrome, which may lead to an airway across the Atlan-

tic, was held under consideration by the Public Works Administration, subject to the approval of the State Department and President Roosevelt. Secretary of Commerce Roper and Aeronautics Branch Director Vidal are endorsing the scheme, originally brought to the attention of P.W.A. by the Seadrome Ocean Dock Corporation, of which Inventor Edward R. Armstrong is president. The original plan demanded a loan of $30,000,000 for the construction of five floating landing fields to be anchored in the Atlantic Ocean between New York and Europe via the Azores along the 39th parallel at intervals of 450 miles. The Atlantic airway, if completed, will be operated as an extension of the federal airways system.

Lufthansa plans ocean route

Transoceanic postal service between Europe and South America is promised for early 1934 with the carrier Westfalen serving as a mid-ocean fueling and servicing base. (AVIATION, May, page 161, July, page 221). Plans for the service are based on successful trial flights of the Dornier Wal twin-engine flying boat Monsoon, which recently flew from British Gambia in Northwest Africa to the Westfalen, was attached to the canvas "train," and craned on board. Next day it was catapulted off the mother-ship and flew to Natal, Brazil. The ship's flying time was 15 hours, 5 minutes, average speed 150 m.p.h. In the regular service the Germans plan to use two flying boats capable of carrying a 3,000-lb. payload. They will operate between Cadiz, Spain, and Brazil with an intermediary call at the Canary Isles. Directional radio will guide them.

Possibilities of a service between Bermuda and the United States in 1934 are being discussed by Pan-American Airways in conjunction with England's Imperial Airways.

Into the stratosphere

First Americans ever to accomplish a free balloon flight into the stratosphere, Lt. Comdr. T. G. W. Settle, U.S.N. and Maj. Chester L. Fordney, of the Marine Corps landed their balloon at Bridgeton, N. J., on the evening of Nov. 20, having taken off at Akron early that morning. Their climb to 61,237 ft. nearly equalled the unofficial Soviet record (not homologated by the F.A.I.) of 63,000 ft. (11.8 miles), and surpassed Piccard's 53,200 ft. (10.1 miles), (AVIATION, Nov., p. 335). Measurements and recordings of the cosmic rays were the main purpose of the flight; in charge of the preparations for these tests were Dr. Arthur H. Compton, of the University of Chicago, and his associate, Dr. R. J. Stephenson. Commander Settle is a veteran balloonist, winner of the James Gordon Bennett Cup Race in 1932, and runner-up this year to the Polish aeronauts. (AVIATION, Oct., page 327.)

DIRECT CONTROL 'GIRO

Inventor Senor Juan le Cierva demonstrates his latest autogiro at Hanworth Aerodrome, England. With no wings, ailerons, or rudder, control is obtained by tilting the entire rotor. Note that "stick" comes down from overhead. Drag of new three blade rotor is reduced by elimination of all droop and spacing cables.

Profit and Loss

Curtiss-Wright Corporation's report of a net profit of $582,450, after depreciation, interest, and other charges, for the nine months ending Sept. 30, stands out in sharp contrast to its net loss of $376,306 for the corresponding period last year. The consolidated net profit for the quarter ended Sept. 30 was $154,376, or 13 cents on the Class A stock, compared with $423,320, or 37 cents per Class A share in the previous quarter, and with a net loss of $408,664 the third quarter of last year. Of the nine months' profit, the Wright Aeronautical Corporation, controlled by Curtiss-Wright, contributed $508,418 after taxes and other charges. This is equal to 85 cents a share on the no-par capital stock and compares with $148,278, or 24 cents a capital share for the nine months ended Sept. 30, 1932. Net profit in the third quarter of this year, after the same charges, was $77,936, or 13 cents a share compared with a net profit of $325,097 in the preceding quarter and a net loss of $218,312 in the third quarter of 1932.

The remainder of the preferred stock of United Aircraft and Transport Corporation, which has represented only a small part of the total capital of the corporation, will be retired on Jan. 1 next. Hereafter the ownership of the company's assets will be represented wholly by common stock. Retirement of the preferred issue and payment of the quarterly dividend will entail a cash payment of $8,362,500. Since, at the end of 1932 the corporation had current assets of $23,868,217, including cash of $4,441,414, and U. S. Government securities of $10,977,546, the operation will not require any new financing. A net profit of $642,107 was reported for the quarter ended on Sept. 30, equivalent, after preferred dividend requirements, to 25 cents a share, as compared with $727,181, or 28 cents a share in the corresponding quarter of last year. For the nine months ended on Sept. 30 the net income was equal to 76 cents a share on the common stock compared with 56 cents for the same period in 1932.

North American Aviation, Inc., and wholly owned subsidiaries, reported a net loss of $355,859, after depreciation, for the first nine months of 1933. As the company was reorganized recently there are no comparable figures.

Aviation Corporation and its subsidiary companies for the nine months ending Sept. 30 showed a consolidated net profit of $395,819.72. This compares with a loss of $2,875,002.35 for the corresponding period of 1932. The consolidated balance sheet of the company and its subsidiaries as of Sept. 30, 1933, reflects current assets amounting to $11,288,496.71, as against current liabilities of $448,314.18.

Net profit of $113,307.31 for the nine months ended Sept. 30 was reported by the Waco Aircraft Company. Sales (net) amounted to $810,985.67; cost of goods sold was $571,533.76, leaving a net manufacturing profit of $239,451.91. Net profit from operations totaled $99,748.79 after deducting $139,703.12 for administrative, selling and engineering expense. Other income less other deductions was $13,558.52.

The Aviation Equipment and Export, Inc., at 25 Beaver Street, New York City, was recently organized by Samuel Niedelman. The company is integral with C. Adrianza and Company, Inc., an exporting house in Venezuela.

Airplane sales

Following by two weeks Transcontinental and Western Air's million-dollar order to the Douglas Aircraft Plant, American Airways placed a $625,000 order with Curtiss-Wright for ten more Condors. Six fast amphibions (top speed 180 m.p.h.) will be delivered by the Fairchild Company to Pan-American for $217,680 (see page 386). The eight-passenger Hornet-powered Northrop Delta delivered to Pan-American for Mexican operation is now in regular service. The Kinner Airplane and Motor Corporation, Ltd., Glendale, Cal., recently sold a 300-hp. four-piace cabin monoplane and three Sportsters. A Great Lakes plane and an OX-powered Waco have been sold through the Ryan Aeronautical Company of San Diego.

The Skylark Aircraft Corporation, of Muskegon, Mich., will revive the manufacture of the Driggs Skylark, a two-place open biplane equipped with either the Rover Inverted or the Cirrus Hi-Drive engine. After purchasing the assets of the Driggs Aircraft Corporation, of Lansing, and Pierson's Flying School, of Belmont, Skylark set up a factory, school, and repair service at Muskegon County Airport.

National defense

An air force one-half as large as all of the European nations' forces put together will be sought when Congress convenes in January by Representative John J. McSwain, chairman of the Committee on Military Affairs of the House of Representatives, providing that no limitation is placed upon aircraft at the Geneva Disarmament Conference, according to the *Army and Navy Journal.*

The *Journal* also reports a prospect, not officially confirmed, of a special committee to survey military, naval, and civil phases of aeronautics. Such a committee will be appointed presumably to repeat and bring up to date the President's Aircraft Board of 1925, over which the late Dwight Morrow presided and which led to the establishment of the Department of Commerce Aeronautics Branch and the Five-Year Programs of the Army and Navy. Rumor has also been rife that upon the reconvening of Congress the President will request legislation for a unified air force and the Department of National Defense.

Macon as war machine

The rigid dirigible Macon had its maiden experience under war conditions this month in the mock battle maneuvers off the California coast.

Starring the program for Navy Day (Oct. 27) was the Macon's 55-hour flight along the California coast. Obscured by fog and darkness the ship remained hidden to all observers despite the efforts of warships in San Francisco Bay to locate it with their searchlights.

VO Squadron 7M of the Quantico Marines flew 3,519 hours during the past year without accident and won the Herbert Schiff Trophy, awarded annually to the naval squadron which compiles the greatest number of flying hours without serious accident to personnel or material.

Improved air service

Airway extensions continue with Northwest Airways' new service from Billings, Mont., to Spokane, Wash., via Helena and Missoula. Ten-passenger Lockheed Electras will fly between Spokane and the Twin cities in approximately 7½ hours, with through connections for Chicago, New York. and other points. American Airways' new fifteen-passenger Condors will fly in 11 hours the Cleveland-Fort Worth service inaugurated on Oct. 27. By night Lockheed monoplanes designed to carry mail and express at 215 m.p.h. will cut 3½ hours from the day run, making possible overnight delivery of Texas mail and express in New York, and placing Fort Worth within 7 hours and 40 minutes of Los Angeles.

Modernizing its service in line with public demand the Central Vermont Railway has joined with the Boston and Maine and the Maine Central Railroads in the operation of an airplane passenger line between Montpelier, Barre, White River Junction, Concord, and Boston. National Airways, Inc., headed by Paul Collins and Amelia Earhart Putnam, which has successfully operated Boston-Maine Airways, Inc., has established the Green Mountain service with three-engine Stinson cabin planes.

A new service linking Long Island with Connecticut was started on Nov. 10 by the Li-Con Airways, Inc. Morning and afternoon round-trips are scheduled, with stops at Islip, L. I.; Roosevelt Field, Bridgeport, and New Haven. Walter T. Varney, former transport operator of San Francisco, plans to establish a taxi service joining Czechoslovakia, Rumania, and Bulgaria. American planes will be used.

Readjustment of the time clock mechanism for rotating beacon lights on the Federal Airways System is well under way and lights operating on a part-time basis have been restored to all-night operation. This action was the result of a decision by Secretary Daniel C. Roper (AVIATION, October, page 327).

Tests with the blind landing systems installed at Newark Airport and Oakland, Cal., are being continued by the Commerce Department.

Commercial adaptation of radio flying aids is being carried on by the Washington Institute of Technology, recently established at the College Park, Md., airport by a group of radio engineers who were formerly with the Department of Commerce and Bureau of Standards.

Five-hour intercity dash

Jimmy Wedell flashed by the Biltmore Hotel Tower in Miami on Nov. 19 exactly 5 hours, 1 minute and 39⅘ seconds after he had taken off from Floyd Bennett Field, New York, 1,210 miles away, thus cutting more than an hour off the previous record. Wedell, whose flight was sponsored by Col. Henry L. Doherty, president of the Florida Year Round Club, averaged about 300 m.p.h. in his Wedell Williams monoplane. Former record-holder: Lou Reichers.

Activities abroad

Under the distinguished command of Gen. Victor Vuillemin a military squadron of 30 Potez 25 T.O.E. biplanes (450-hp. Lorraine engines) set forth from France this month for a group flight around French Africa. Shortly after the Armistice, Vuillemin flew from Constantinople (Istanbul) to France in one day, the first time it had been done.

The crash of the Soviet transport K-7, the world's largest landplane, at Kharkov on Nov. 21, killing fourteen persons, was the second blow to Russian aviation in recent months. Several high government officials were killed in September when the ANT-7 crashed and burned (AVIATION, November, page 356). The K-7 had six motors, contained sleeping quarters for 64 passengers.

Timed by officials of the French Aero Club, Maj. Pietro Scapinelli of the High Speed Flying School at Desenzano flew over a triangular closed circuit for half an hour at an average speed of 619.28 kilometers per hr., (384.86 m.p.h.) and was temporarily awarded the Bleriot Speed Cup. Donated by Louis Bleriot, pioneer aviator, the trophy is to be given permanently to the pilot who first attains a speed of 1,000 km.p.h. (621.37 m.p.h.). Major Scapinelli used the twin-motored Macchi 72 seaplane in which Lt. Col. Cassinelli on Oct. 8 set a record of 393.3 m.p.h. over a closed circuit of 62.1

LT. GEORGE R. JOHNSON, 32, of the New Jersey National Guard, whose discoveries by means of aerial photography in the Andes of Peru are internationally known, was killed on Nov. 5. The plane he was piloting crashed near the Red Bank, N. J., airport. Lt. Johnson was formerly chief aerial photographer of the Peruvian Navy, and was a co-leader of the Shippee-Johnson Expedition to Peru in 1930-31. He was an officer of Aerial Exploration, Inc., of New York City.

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miles (AVIATION, November, 1933, page 355).

Airport seeks federal aid

Because Newark, N. J., lacks funds to pay the debt charges on the bonds issued for the construction of the municipal airport, Mayor Ellenstein will ask the government either to buy or take over the field in some other way. The city apparently forgets that the Air Commerce Act specifically prohibits the Department of Commerce from engaging in airport activities.

Airlines must pay

Another gas tax decision against air transport ends American Airways' fight in Louisiana. As interstate operators, American Airways claimed exemption from the Louisiana 5-cent gas tax (AVIATION, August, page 251), but the U.S. Supreme Court declared the state tax not unconstitutional. The decision recalls that handed down by the U.S. Supreme Court in the case of Boeing Air Transport *vs.* Wyoming (AVIATION, June, page 190) in which such a tax was found to be not a restraint upon interstate commerce nor a violation of the commerce clause of the Constitution.

Russian-Curtiss-Wright agreement

Fourteen Soviet engineers have been undergoing training in the production of Wright Aircraft Motors since July in the Wright Aeronautical plant at Paterson, N. J. Last April the Curtiss-Wright Corporation made an arrangement with the Amtorg Trading Corporation by which the American engines will be manufactured in Russia under American supervision. Certain engines, including the radial air-cooled Wright Cyclone and the liquid-cooled Curtiss Conqueror, are specified in the agreement.

The Curtiss-Wright Corporation moved this month from its offices on West 57th Street, New York City, to new quarters at Rockefeller Center, in the R.C.A. Building. The Institute of Aeronautical Sciences has a clubroom and offices in the same building.

Personnel

C. A. Snow, Jr., a Washington, D. C., attorney, has been appointed aeronautical expert with the Aeronautics Branch of the Department of Commerce. He volunteered his services to the Aeronautics Branch at a remuneration of $1 a year.

Ray Cooper, manager of many air shows in Detroit and elsewhere, has been appointed general manager of the National Aeronautic Association.

Major Alexander de Seversky, aircraft designer and holder of the world's speed record for amphibions (AVIATION, November, page 355) is now employed by the Chrysler Corporation through its subsidiary, the De Soto Corporation, as consulting engineer at the same time continuing his work with his own company, the Seversky Corporation. He has recently perfected plans for the production of small all-metal planes to sell under $1,000.

Col. Samuel Price Wetherill, Jr., was elected president of the Air Defense League to succeed John B. Stetson, Jr., former ambassador to Poland, resigned.

Zantford D. Granville, maker of the Gee Bee sport and race planes, has opened an engineering consulting office in New York. His associates are Howell Miller and Donald de Lackner, formerly of the engineering department of the Granville plant in Springfield, Mass.

Fowler W. Barker is now with the Aeronautical Chamber of Commerce as assistant to Leighton Rogers, executive vice-president.

SIDE SLIPS

By Robert R. Osborn

H. W. B. of Dundalk, Md., sends a clipping from the Baltimore *Post*, giving a bit of German aeronautical news,—"One hundred and twenty-four

airplanes manned by cracked pilots took off from Tempelhof Airdrome early today—"

We have always known that we had quite a few of that type of pilot over here, but this we believe, is a record gathering.

We read that under the new pay rates for pilots on most of the scheduled airlines they are to receive $7.50 an hour, hotel expenses, a portion of the group insurance expenses and will get two weeks vacation with basic pay. This is all very well, but the question which still needs to be settled is: who is going to pay back the money and cigarettes borrowed by the pilots from the chief mechanics at the various fields?

We are sorry that we missed this clipping when it first came in, but we consider it still worth while adding to the collection, showing as it does the great variety of uses to which the airplane can be put:

"Milwaukee—Mal Freeburg, college graduate, law student, air mail and transport pilot here, was guest of honor at the Tripoli Booster club Friday noon, in place of the injured Wiley Post, Freeburg has twice landed passenger planes after propellers have broken and damaged the landing gear, and once saved a Burlington train by *flogging* it with flares before it reached a washed out *bride*. He was decorated by President Hoover."—Wisconsin *State Journal* clipping, thanks to L. W., of Madison.

If it were not for our inviolable rule against puns in this column, we would inquire if the recent stratosphere flight of Lieutenant-Commander Settle and Major Fordney might not be an experiment on the part of the government to see just how far inflation could be carried?

Whenever free-ballooning is the subject of conversation we remember the story of a friend who used to be in that section of Navy operations out of Lakehurst, N. J. He said he was drifting along over the pines of South Jersey at the end of flight, and it was evident that he was going to land in one of the numerous swamps for which Jersey is famous. The prospect wasn't very pleasant but he couldn't do much about it as he was low on gas and was out of ballast. However, he drifted over a shack in the woods and below him could

see a colored lady bending over a washtub and hard at work. Then it occurred to him that if he could get rid of his parachute he might get just enough altitude to clear the swamp. So he dropped the chute, plop, alongside of the lady and her tub, and started to say, "Here, will you keep this for me—?" but didn't get any farther than that. The colored lady had completely disappeared so quickly he couldn't even tell which direction she had run.

FLYING EQUIPMENT

New Equipment for Pan American

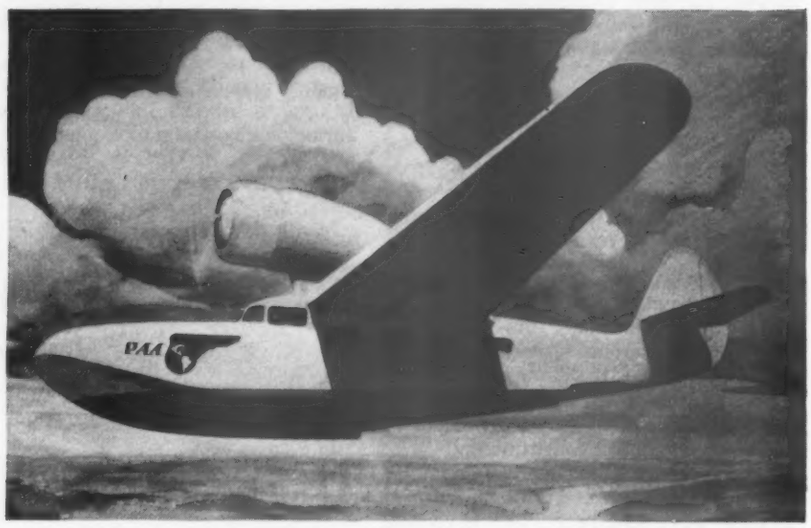
SUPPLEMENTING a program recently announced for the construction of six flying boats of unusually large size for long-range development work, a contract has been let to the Fairchild Aviation Corporation for six single-engine high-speed amphibions which are expected to yield performances in the range of modern land planes.

Practically every known device has been employed to reduce parasite and interference drag to a minimum. The hull has excellent lines with smooth metal covering and a minimum of projections. All rivets are countersunk flush with surface. The monoplane wings are of the full cantilevered type well filleted at the intersection with the hull. The single engine nacelle mounted over the center line well forward is not only of good aerodynamic form, complete with N.A.C.A. cowl, but is supported on a narrow frame-work built closely around the center line of the ship with all its members inclosed in a single streamlined housing well faired at top and base. There are no exposed bracing struts or wires of any kind.

The arrangement of the wheel-type landing gear is unique in that the main wheels and their supporting structure are retracted not into the hull in the usual manner, but up into the undersurface of the wing just outboard from the hull. The retraction is accomplished by moving the upper end of the vertical strut (which carries wheel fork and shock units) inward along the wing spar by means of a long screw driven by an electric motor. Another unusual feature is in the partial retraction of the wing tip floats up against the lower surface of the wing when not in use, thus eliminating the parasite drag of the supporting strut and much of the interference of the float and strut. The tail wheel is also retractable into the after portion of the hull.

The wings, tapered in thickness and in plan, are of the two spar type. The interior structure and the covering are all-metal, with all exterior rivets countersunk flush with the skin. Front spar loads are carried across the hull through a bulkhead immediately behind the pilot's seat, and rear spar load through a bulkhead which divides the cabin into two parts. The ailerons are of the conventional type and mounting. Trailing edge flaps are set in those portions of the wing inboard from the tip floats.

The tail surfaces are conventional, metal framed and metal covered. The fin is built as an integral part of the hull. The horizontal surfaces are supported by the fin (the stabilizer is braced rigidly to the hull through a single strut on each side). Both rudder and elevator are equipped with control tabs.



Artist's sketch of new Pan-American Fairchild Amphibion in flight.

Accommodations are provided for ten people, two pilots and eight passengers (maximum), the latter arranged four each in the two compartments. For certain runs the passenger seats may be removed from the forward compartment, thus making it available for cargo. Normally, entrance is gained to the cabin through a hatch in the port side just aft of the wing. Emergency exits are provided in the forward cabin compartment and above the pilots' seats.

Ahead of the cockpit is a 50 cu.ft. space for miscellaneous marine equipment and baggage. A hatchway in the forward part of this compartment permits one of the crew to go forward for anchoring or mooring purposes. An anchor locker is in the extreme bow, reached through a small hatch in the deck.

Among the auxiliary equipment planned for these amphibions is a small outboard marine engine which may be mounted on a collapsible bracket at the bow and operated from the anchor hatch for maneuvering the plane on the water in crowded harbors, or for emergency use at sea.

The design contemplates the use of a Hornet S3D1 engine supercharged to deliver 645 hp. at 2,000 r.p.m. up to 3,000 ft. Hamilton standard controllable pitch propeller will be fitted. With this power plant the ship is expected to show a high speed of 180 m.p.h. at sea level as an amphibion, cruising (at 65 per cent horsepower) at 155 m.p.h. The minimum speed without the flaps is to be 65 m.p.h., 55 m.p.h. with flaps down.

Kinner Playboy Low Wing Monoplane

THE first of a new series of Kinner low wing monoplanes for general sport purposes has recently been delivered to Dr. Ross Sutherland, a California physician, who plans to make use of it not only for pleasure but also for professional purposes.

The general details of the ship correspond very closely to those of recent high-speed racers. Its thin monoplane wings are wire braced both to the upper longerons of the fuselage and to the undercarriage. The latter is of the divided type with cantilever wheel forks pinned to inverted rigid vee struts. Wheels, struts, and shock units are fully inclosed in smooth, streamline housings.

The fuselage is a rectangular structure of welded chrome-molybdenum steel tubing, faired to an oval section and covered with fabric. The wing stubs and landing gear supports are also of chrome-molybdenum steel built integral with the fuselage. The wing panels outboard from the stubs are built up of spruce spars with steel compression struts, wood ribs, the whole fabric-covered. Ailerons are of the tapered type incorporating Frise balance and operated by a differential control.

The tail unit is built of welded steel covered with fabric. Stabilizer and fin are fixed and are rigidly braced together with streamline wires. The elevators are provided with trimming tabs similar

to those in current use on transports.

Power plant consists of one Kinner R-5 160-hp., five-cylinder radial engine on a detachable steel tube welded engine mount. Fifty-two gallons of fuel are provided for in two tanks, one in the fuselage arranged for gravity feed, and one located in the right wing stub. In addition to the 52 gal. of fuel, the ship is licensed to carry two persons and 122 lb. of baggage. It shows a top speed of 135 miles an hour and cruises at 125. It climbs 800 ft. in the first minute at sea level and has an absolute ceiling of some 16,000 ft. Fuel supply is sufficient for a cruising radius of five hours. The general specifications are: span, 29 ft.; length overall, 24 ft. 2 in.; height, 7 ft. 9 in.; wing area, 142 sq.ft.; weight, empty, 1,370 lb.; useful load, 800 lb.; gross weight, 2,170 lb.; wing loading, 15.27 lb. per sq.ft.; power loading, 13.56 lb. per hp.

New Kinner Playboy—racing design practice reflected in a trim machine for the private flyer. Sliding cockpit cover gives all-weather service.

A Pair of Navy Fighters

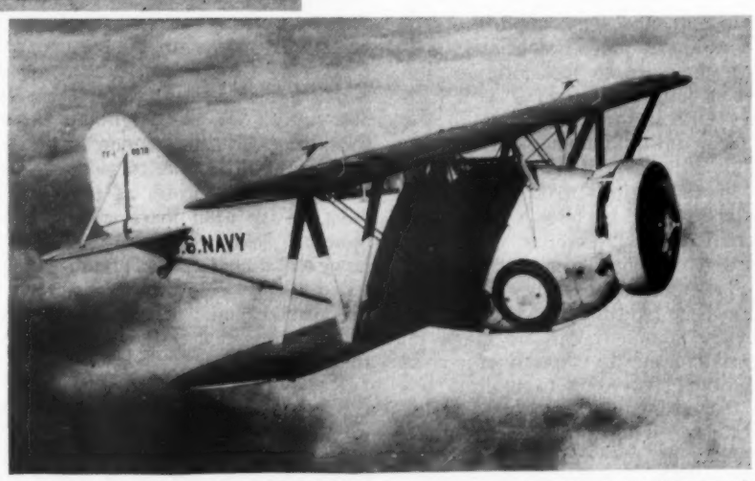
ALTHOUGH the Boeing F4B-4 fighters have been in active service for some time, the specifications have just been released. This single-seat high-performance fighter and light bomber was designed primarily for carrier use but a number of them are also in operation from land bases in the hands of Marine Corps pilots.

The fuselage is of composite construction, being built up of welded chrome molybdenum steel tubing, metal cowled, forward of the front lower wing spar. Behind this point a semi-monocoque duralumin structure is used. The steel tube engine mount is detachable. Wings consist of one upper panel and two lower panels interconnected by a single N strut system on each side. All interplane and cabane struts are of streamlined duralumin tubing. Wings are built up of spruce flanged and mahogany plywood webbed box beams with wooden ribs and fabric covering. Ailerons are set in the upper wings only and are aluminum alloy frames covered with corrugated aluminum alloy sheets. Provision is made in the upper wing panel for emergency flotation gear. Tail surfaces are all-metal framed, covered with corrugated dural sheets. Stabilizer is adjustable in flight.

Landing gear is of straight axle type equipped with oleo shock absorbers and hydraulic brakes. Side loads are taken by a V-truss from the center of the axle to the under part of the fuselage. The steerable tail wheel is also equipped with an oleo shock absorber.

The power plant consists of one 500 hp. Pratt & Whitney supercharged Wasp. A 55 gal. fuel tank is mounted in the fuselage and an auxiliary droppable tank also of 55 gal. is hung just aft of the landing gear. Seven gallons of oil are carried in a welded aluminum tank. The general specifications of the machine are: Span upper, 30 ft., span lower, 26 ft. 4 in.; length overall, 20 ft. 5 in.; height, 9 ft. 9 in.; wing area, 227.5 sq. ft.; weight empty, 2,301.2 lb.; disposable load (as a bomber), 1,045.5 lb.; disposable load (as a fighter), 714.3 lb.; gross weight (as a fighter), 3,015.5 lb.; gross weight (as a bomber with two 116-lb. bombs), 3,355.6 lb.; wing loading, 13.25 lb. per sq.ft.; power loading (450 hp.), 6.03 lb. per hp.

Although few details have been released, considerable experimental work has been completed on a new type two-seat fighter for the Navy, the FF-1. This machine is a biplane of more or less conventional form except that the undercarriage is completely retractable in flight. It is powered with a Wright Cyclone and was designed by Grumman Aircraft, Inc., Farmingdale, N. Y.



Above, left: The Boeing F4B-4 fighter in current use by the U. S. Navy and the U.S. Marines. Above: The latest type two-seater fighter for the U.S. Navy, the Grumman FF-1.

TECHNICAL REPORT OF THE BRITISH AERONAUTICAL RESEARCH COMMITTEE, 1931-32; *London, 1933; 2 vol.; 1,100 pages; $17 approximately.*

ANNUAL REPORT OF THE NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS, 1932 *(including technical reports Nos. 401 to 440); Washington, 1933; 745 pages; $2.50.*

IT IS a difficult matter to review reports such as these. They range the whole span of aeronautics, and far outside into related fields. Though the work is necessarily of somewhat variable importance and quality, both the British and American committees select and edit with such care that the standard is always high. The American and British practices in publication of research have been drawing together in recent years, each perhaps learning from the other. No longer is it true that the British reports are more likely to be highly mathematical than the American ones, or if there is a difference in that respect it is much less marked than in previous years. No longer is it true as in the past that the British reports are likely to be brief and devoted to a single investigation, while the American ones are longer and arranged each to cover a whole group of related studies. Both British and American committees could in the past be criticized for not giving enough specific and practical information on the application of the results of their studies. While there is perhaps still some reason for making that criticism, and some opportunity to make the reports more immediately useful than they are to the designer, the fault is no longer serious. The British volumes still suffer, as always in the past, from unsatisfactory presentation of graphical material, but a full tabulation of the figures from which the curves are plotted supplies a substantial counterbalance. Divorcing one's self from every patriotic consideration and looking at the volumes together, high tribute can be paid to them both and no categorical comment can be made on their relative merits, though of course the National Advisory Committee has at its disposal equipment, such as the new full-scale wind tunnel and the new water channel, for which there is no parallel anywhere else in the world, while the contents of the British report, as always in the past, range over a much wider field than the American one covers. The American committee presents 41 technical reports, the British committee 56.

Among the most striking of the British contributions are a new series of studies on propellers running at very high tip speed, an inquiry into the structural loads on ailerons, and a large amount of work on spinning, including the first reports of tests in the spinning tunnel where models are dropped and allowed to spin freely while supported by a rising current of air. Particularly striking among the American contributions are the first two reports on the effect of nacelle position on over-all performance (the studies which fixed the engine location for recent twin-engined transport and bombing planes), the first four of the series on lateral control devices of various types, the flight tests and performance studies on an autogiro, the results of tests on a large model of the Akron, and a number of papers on various phases of the problem of spraying fuel into direct-induction engines. Both the American and the British reports, of course, are prefaced by the usual thorough and interesting surveys of the technical progress of the year in the countries concerned (the American summary being much broader than the British one, which is almost entirely limited to work done under the direct supervision of the Aeronautical Research Committee).

PROCEEDINGS OF THE FORTY-FOURTH ANNUAL CONVENTION OF THE NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS; *State Law Reporting Company; New York, 1933; 704 pages; $5.* As might be expected, the State Utilities commissioners devoted very little time to aviation during their annual meeting, as most of them have so far been inactive in the aeronautical field. Their proceedings do, however, include some fifteen pages devoted to the reprinting of a report of the special committee on the regulation of air transport and of the discussion thereon.

Reviewing the present situation, the report concluded that the action of state regulatory bodies should be limited to the exercise of police power in the interest of safety. Two of the members dissented, however, and foresaw a need for a larger amount of state activity in the regulation of air transport. Commissioner Greenleaf of Kansas presented a paper arguing for regulation. Commissioner Drake of Nebraska argued against it, at least for the present. The book includes a very interesting tabulation of data on the present policies of the states requiring certificates of convenience and necessity for airlines. The eleven states listed have so far granted a total of 76 certificates (43 of them in Pennsylvania), and refused ten applications (eight of them in Arizona). Pennsylvania has granted 98 per cent of all applications; Arizona only 43 per cent. The volume includes also the paper of Mr. Porter, chairman of the Interstate Commerce Commission, arguing for the creation of a bureau of transportation at Washington to have regulatory powers over all forms of transport,—land, water, and air.

MULTIPLE LENS AERIAL CAMERAS IN MAPPING, *by the Technical Staff of the Fairchild Aerial Camera Corporation.; New York, 1933; 161 pages; $5.* The development of aerial photography by multiple-lens cameras has progressed apace since the publication of Captain McKinley's excellent treatise in 1929. Since that time the five-lens camera has put in its appearance and has been widely accepted by the services for important mapping details. The present text book has been compiled by technicians of the Fairchild Aerial Camera Corporation in co-operation with Army and Navy photographers to bring the subject strictly up to date. It covers all phases of the work from the technique of taking a picture through the final stages of translating photographs into maps. Bound in cloth covers, copiously illustrated with photographs and diagrams, it makes a valuable addition to the library of anyone interested in aerial photography.

AIRWAYS OF AMERICA, GUIDE BOOK No. 1, *by A. K. Lobeck; The Geographical Press, Columbia University, New York, 1933; 207 pages; $2.50.* Anyone having the faintest interest in topography, geography or geology would find this book an invaluable companion piece for a trans-continental trip along the northern route followed by United Air Lines. For that matter, it is not necessary to make the trip to enjoy the book, for it is full of valuable and interesting material about large areas of the United States. Field work was done and the book published under the James Furman Kemp Memorial Fund for Research and Publication in Geology, and it is implied that a further study will be made of the routes of other transcontinental airlines in America. The book is fully illustrated by photographs made from the air and a large number of charts and maps showing the entire route, section by section, from New York to San Francisco.

SERVICING SHORT CUTS

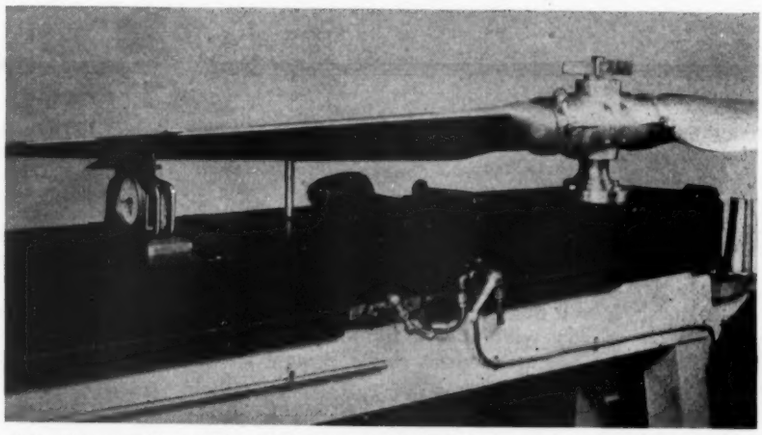
Propeller Overhaul Tools

AMONG new tools and accessories, developed at the Naval Air Station at Pensacola to promote efficiency and production in the propeller shop, is a propeller pitch protractor (designed by Leo. G. Cox) which embodies the reading of angles on a clocklike dial instead of by vernier. This instrument is capable of measuring angles to the nearest minute of arc, whereas the usual type of vernier pitch protractor cannot be relied upon for readings nearer than five minutes of arc even under favorable conditions. The use of a plain reading dial—as easy to read as a clock face—eliminates many chances of error that occur when reading a vernier.

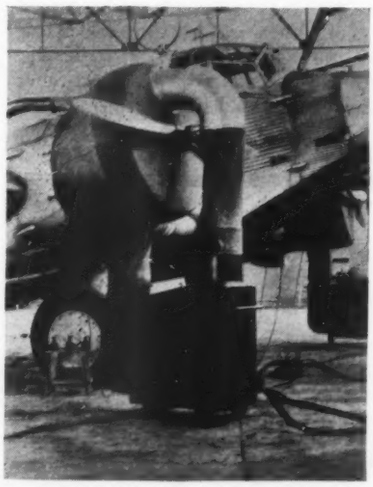
The value of the new protractor was discovered while the instrument was still in the development stage. Certain propellers set as carefully as possible with the old type of protractor were issued for service, but were returned to the shop because of excessive vibration. When checked by the new protractor differences in pitch of as much as ten minutes of arc between the two blades were discovered. Reset by the new protractor and reissued without further overhaul these propellers gave satisfactory service.

The propeller protractor table has also been completely redesigned. In place of the former solid supporting spindle at the end of the table, a hollow shaft is fitted through which slides a clamp shaft controlled by an air cylinder. A second air cylinder raises and lowers a vertical stop pin (seen near the head of the mallet lying on the table). A two-way air valve, shown on the near side of the table, controls both cylinders. The propeller is aligned and held in position by two tapered collets (substituting for the front and back cones of the engine shaft) that are seated in the hub by the downward pressure of the flat key in the clamp shaft when air is admitted above the piston in the air cylinder.

The photograph shows a propeller clamped in place on the shaft with one blade held in position over the centerline of the table by the stop pin. A turn of the air valve handle lowers the stop pin out of the way and releases the clamp so that the propeller can be swung into position and reclamped to check the other blade. By means of the hand crank at the left of the air valve, the stop pin can be traversed part way across the table to take care of propellers with wider or narrower blades. This new arrangement of the table not only permits of holding a propeller more rigidly than was possible on the former spindle but also saves much time and labor in making the first set-up of each propeller.



Propeller checking table of Naval Air Station at Pensacola showing the Cox Protractor in use. Note dial readings of angle. Small pointer indicates degrees (one revolution—36 deg.), large reads minutes (one revolution—60 min.)



Engine heater in use on a Junkers three-engined monoplane at A.B. Aerotransport's, Malmöe Base. Note manifolding of hot water connection.

Engine Warming Device

THE July, 1932 issue of AVIATION illustrated an arrangement worked out by the maintenance department of Eastern Air Transport at Atlanta for keeping the Curtiss Conqueror engines on the Condors warm while machines were standing in the hangar. It will be recalled that warm air is delivered to the under part of the engine nacelle through a canvas duct connected up with one of the regular steam heating units mounted on the hangar wall. One of the accompanying illustrations shows another interpretation of this same idea, developed by the Swedish air line, A. B. Aerotransport, for use in their servicing hangars at Malmöe. Individual heating units are provided for each engine. These consist of small sheet metal cabinets mounted on wheels for easy transportation, containing a nest of heating coils. Large canvas and metal ducts connect the heaters with a canvas hood completely enclosing the engine. Warm air is delivered near the top of the enclosure and the cooled air withdrawn from the bottom. By forcing hot water through the heating coils sufficient warm air may be circulated through the engine to maintain it well above hangar temperature even in the coldest weather.

Simplifying tool marking

ACCORDING to a recent Bureau of Aeronautics News Letter, certain naval aircraft repair stations have found that an electric pencil simplifies the permanent marking of all hand tools for identification. It was formerly the practice to stamp small tools with steel dies, a slow process at best, and one involving a rather high loss of dies, for frequently the tool being harder than the die the points would flatten and be rendered useless. The electric pencil method is extremely simple, as it involves merely an insulated metal electrode connected to one side of a power circuit. The tool to be marked is grounded with a suitable clamp, and the desired letters are simply traced on it with the point of the electrode.

THE BUYERS' LOG BOOK

AVIATION'S *Card Index of New Equipment*

This department is equipped to help readers locate manufacturers of any parts, accessories or materials.

AIRPORT EQUIPMENT — **Loader, tractor**

Euclid-Armington Road Machinery Company, Cleveland, Ohio

A SCOOP-TYPE LOADER for handling snow, gravel, coal, loose dirt or other bulk materials about airports or factories is offered as an auxiliary attachment for Cletrac tractors. It will fit on either Standard or Hillside models (20, 25, or 35) without drilling or altering the machine. Hydraulic operation from single control lever. Capacity, 14-20 cu.ft.

AVIATION, *December, 1933*

DRAFTING EQUIPMENT — **Drawing machine**

Fletcher F. Milligan Company, 4601 Prospect Avenue, Cleveland, Ohio

THE Wrigraph Draft Block, in the Junior size, is a portable drawing machine which can be adapted to the needs of aerial navigators and surveyors. Small enough to fit into an ordinary brief case, it consists of a ¼ in. Masonite board fitted with spring paper clips and a pantograph parallel ruler device provided with adjustable scales, triangles and protractor. Holds pads or single sheets.

AVIATION, *December, 1933*

ENGINE ACCESSORIES — **Battery ignition**

Scintilla Magneto Company, Inc., Sydney, N. Y.

IN ADDITION to the standard line of magnetos for aircraft engines put out by this company, announcement has been made of a new series of parts and equipment for battery ignition applicable either to existing engines or to be incorporated into new designs. All equipment for such purposes, including a new line of unit switches for single or multiple engine installations, is radio shielded.

AVIATION, *December, 1933*

ENGINE ACCESSORIES — **Exhaust manifolds**

Solar Aircraft Company, Ltd., Lindbergh Field, San Diego, Cal.

SPECIALIZING in the design of collector rings and exhaust manifolds, this company is in a position to furnish such equipment for all types of engine and installation. All manifolds are of stainless steel, welded. Special attention is given to problems of expansion, smooth gas flow, minimum back pressure. Shops also equipped to handle other airplane parts in welded stainless steels.

AVIATION, *December, 1933*

LABORATORY EQUIPMENT — **Stiffness tester**

Smith-Taber, North Tonawanda, N. Y.

THE Model E Stiffness Tester has been developed to determine the resistance to bending of all types of materials including sheet metals, wires and fabrics. Particularly adapted to the testing of extremely light gages which cannot be tested for hardness by ordinary methods. Handles wires down to 0.050 in., sheet metals to .010 in. Also adapted to plastic flow studies.

AVIATION, *December, 1933*

LABORATORY EQUIPMENT — **Propeller blade balance**

Toledo Scale Company, Toledo, Ohio

AN INDICATING BALANCE to give direct readings of longitudinal moment and out-of-balance on the minor axes of metal propeller blades, without reference to a master blade, now offered. Scales graduated to 0.1 in.lb. on both axes. Adapters available to permit accommodation of all blade sizes. Claimed that blades may be balanced more accurately than by master system.

AVIATION, *December, 1933*

SHOP EQUIPMENT — **Hot air blower**

The Breuer Electric Manufacturing Company, 852 Blackhawk Street, Chicago, Ill.

THE Tornado Heat Blower is designed for use with any source of compressed air to furnish a hot blast (650 deg. F. at the nozzle) to warm up oils and greases, thaw out frozen fuel or oil lines, or to dry out damp electrical apparatus. Heating done electrically. Flexible cord connection to current source. Equipped with Schrader valve. One lever controls both air and electricity.

AVIATION, *December, 1933*

SHOP EQUIPMENT — **Air compressors**

Brunner Manufacturing Company, Utica, N. Y.

TWO new models of self contained compressed air units announced, one with usual horizontal tank (H-6), and other with vertical tank (V-6) to save floor space. Two-cylinder compressor driven by standard make electric motor through vee belt. Fitted with automatic pressure control, air filter, intake muffler, fan type fly-wheel. Hardened and ground shafts mounted in large bearings.

AVIATION, *December, 1933*